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PROGRESSIVE MEDICINE

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES
AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES

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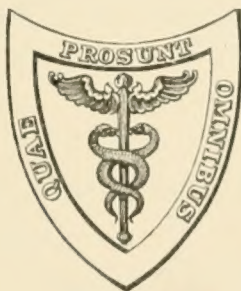
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VOLUME I. MARCH, 1910

SURGERY OF THE HEAD, NECK, AND THORAX—INFECTIOUS DISEASES, INCLUDING
ACUTE RHEUMATISM, CROUPOUS PNEUMONIA, AND INFLUENZA—
THE DISEASES OF CHILDREN—RHINOLOGY AND
LARYNGOLOGY—OTOLOGY



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PROGRESSIVE MEDICINE.

MARCH, 1910.

SURGERY OF THE HEAD, NECK, AND THORAX.

By CHARLES H. FRAZIER, M.D.

THE CRANIAL NERVES.

Trigeminal Neuralgia. While the last chapter of trigeminal neuralgia may not have been written, we may go so far as to say that of all the operations on the central nervous system, in none has a greater degree of perfection been obtained and in none are the results so satisfactory. The surgery of the fifth nerve has been dwelt upon so frequently and so extensively in previous volumes of PROGRESSIVE MEDICINE that I scarcely feel justified in discussing the matter again too much at length. There is one phase of this question, however, upon which I have spoken before, and feel justified in speaking of again, namely, the relative gravity of the operation. We have gotten to a point now where we can say, without fear of contradiction, that the mortality of this operation in experienced hands should be less than 3 per cent. In my own series of cases, now numbering 35, there has only been 1 death, the sixth of the series, and I now approach these operations with no more apprehension than any other major procedure.

In an article recently published¹ I have reviewed somewhat at length my experience with both the intracranial and extracranial operations upon the trigeminal nerve, and in a still more recent contribution² the intracranial surgery of the trigeminal and the auditory nerves has been treated in a comprehensive manner. The technique which I now employ differs little from that originally advocated. The approach to the ganglion is somewhat posterior to that usually advocated, the middle meningeal artery is always ligated, the zygoma is never resected, and the operation is concluded by extracting the sensory root. As to the complications of the operation, there has never been any injury to

¹ University of Pennsylvania Medical Bulletin, April, 1909.

² Keen's Surgery, vol. v, chap. 79

the cavernous sinus, there have never been any cerebral complications, and all but few have been performed in one stage. Keratitis developed in three instances, in two of which the lesion responded to treatment, and in one case the oculomotor nerve was injured. The first operation by this method (the so-called physiological extirpation of the ganglion) was performed in 1901, now nine years ago. That there has been no restoration of sensation in the anesthetic area removes beyond question the possibility of nerve regeneration and recurrence, and enables us to recommend this operation without hesitation as a substitute for gasserectomy.

The treatment of trigeminal neuralgia by the so-called Schlosser method, by which *alcohol* is injected into the second and third divisions at their points of emergence from the skull is still being very extensively used and seems to be growing in favor. Kiliani¹ reports 190 cases of which he has injected since 1906. In this series he had 5 failures and 185 cases free from pain for a varying length of time. The number of injections varied from two to ten, with an average of three.

Hulles² reviews the cases which have been treated by operation during the last ten years in v. Eiselsberg's clinic, and finds that *peripheral operations* invariably were followed by a recurrence. Even resection of the nerve at the base of the skull was nevertheless followed frequently by recurrences, though after a longer interval. *Gasserectomy* after all offers the only hope of permanent relief, and should be resorted to without hesitation in all severe cases, especially if two branches are involved. His table shows very clearly the difference in the results of the various methods.

Operation.	No.	Cured.	Severe recurrence.	Light recurrence.	Undeterminable.
Avulsion	23	0	22	0	1
Resection at base of skull .	13	3	55	5	0
Gasserectomy	10	8	0	0	2

Jaboulay and Morestin³ recommend the so-called physiological extirpation of the ganglion, advocated by Spiller and myself, as being "equally efficient, and much less dangerous than gasserectomy, more easy of accomplishment, and therefore to be preferred in all cases."

One should always bear in mind that after operations upon the ganglion or its sensory root some precautionary measures must be adopted to prevent ulceration of the cornea. The eye should be protected by a suitable shield for three or four weeks, and for this purpose I have found an automobile goggle the most comfortable and in other respects the most satisfactory protection; when the shield is removed the eye should be examined weekly for a further period of from six to

¹ Medical Record, June 5, 1909.

² Wien. klin. Woch., vol. xxii, No. 27.

³ XXI Congrès français de Chir., 1908.

eight weeks. Even when corneal ulceration develops the prognosis is excellent, providing appropriate measures are enforced without delay. The possibilities of recurrence must be borne in mind.

As to the relative frequency of this complication, from my own experience I should say it was uncommon; after some 35 operations on the sensory root it developed but three times, and it is therefore somewhat surprising to find that Kollner¹ found it in 25 per cent. after 47 cases of gasserectomy, and of the 18 patients operated upon in Bier's clinic during the past ten years, there was some involvement of the cornea in 10.

In speaking of the treatment of trigeminal neuralgia, Rasumowsky² refers to Morestin's suggestion as to the nomenclature of the operation in which the sensory root is divided, the ganglion not disturbed. Instead of calling it "the physiological extirpation," according to Van Gehuchten, he suggests as more appropriate, "the isolation of the Gasserian ganglion." This operation he says now has the endorsement of the leading surgeons, including Kocher, Jaboulay, and others. Rasumowsky, in the case he operated upon, not only divided the sensory root, but also resected the intracranial portion of the second and third divisions, and goes so far as to recommend it as a routine procedure. I might say, in passing, that these suggestions should not be taken too seriously, since, if division of the sensory root is equivalent to the removal of the ganglion, it is evidently unnecessary to remove anything on the distal side of the ganglion. In the case above just alluded to, corneal ulcer developed three months after the operation. This must have been due to some irritation, such as a particle of dust, and not to trophic disturbances. If of trophic origin, there would have been some disturbance of the cornea immediately after the operation and not three months later.

Facial Paralysis. The propriety of early operation in cases of otherwise hopeless facial paralysis is generally recognized. There is still some division of opinion as to which motor nerve should be selected, the spinal accessory or hypoglossal. Judged by the number of times each has been used, the hypoglossal is the favorite, and, though I have tried the spinal accessory, I am still strongly in favor of the hypoglossal. The one objection to the hypoglossal was the resulting hemiatrophy of the tongue, and that this can now be obviated has been shown by Ballance, who, in a case about to be referred to, prevented hemiatrophy of the tongue by anastomosing the distal end of the hypoglossal nerve to a portion of the spinal accessory. This combination, faciohypoglossal plus hypoglossal-spinal accessory anastomosis, will I believe be finally accepted as the ideal method, and will come to be the established procedure for the relief of facial paralysis.

¹ Münch. med. Wochen., vol. iv. No. 49.

² Archiv f. klin. Chir., Band lxxxviii. Heft 4.

In Ballance's¹ case the patient had a complete left-sided facial paralysis of three year's duration. She had had, before coming to Ballance, seven operations for middle-ear disease, and at one of these the facial nerve had been divided in the descending portion of the Fallopian canal. The hypoglossal nerve was carefully dissected out to the posterior border of the hypoglossal muscle, and the central end of this nerve anastomosed with the peripheral end of the facial. When this was completed the spinal accessory was isolated and split longitudinally a distance of two inches, and one-half of the nerve divided transversely at the distal end of the slit. The strip thus obtained was raised and united end to end with the peripheral portion of the divided hypoglossal nerve. Six weeks later the left trapezius, sternomastoid, and the left side of the tongue had atrophied, but twenty months later the nutritional and functional recovery of the facial, lingual, and cervical muscles was complete. The movements of the face and tongue were dissociated, but if there was a sudden movement of the shoulder a wave of muscular contraction could be seen passing from the back of the left side of the tongue out to the tip.

Freeman² advocates deferring operation three to six months in all doubtful cases. To this the majority of observers agree, although it should be borne in mind that brilliant results have been obtained by operating many years after the onset of the palsy.

My experience in the operative treatment of facial paralysis has been on the whole satisfactory, and it is rather surprising to read Jiami's³ statement as to the results. He says: "Of nineteen operative cases, in only four were useful results obtained. In the other fifteen cases the results were either incomplete or practically nil. Not only is the operation unnecessary but even harmful."

Such a statement would give one a very false impression of what I believe to have been the results up to the present time. Every one realizes the difficulty of obtaining what might be called an ideal result, namely, one in which there is restoration of all the expressional movements, such as laughing and crying. But there are many degrees of improvement, in all of which the function of the nerve has been sufficiently restored to justify the operation. In other words, the restoration of complete symmetry in repose would of itself justify the operation; or, again, the restoration of the coarser voluntary movements, such as closing the eye, raising and lowering the angle of the mouth. Such a result I should regard as most satisfactory. Because of his skepticism in this treatment of facial paralysis, the author, writing from Jonescu's clinic, advocates a different method which, however, has only been practised once. It is ingenious, nevertheless, and consists essentially

¹ *Lancet*, June 12, 1909.

² *International Clinics*, vol. i. nineteenth series.

³ *Deutsch. Zeitsch. für Chirur.*, Band cii, Heft 4 to 6.

in transplanting one-half of the masseter muscle and suturing the divided stump of the transplanted segment to the superior and inferior orbicularis oris. The idea in this operation was drawn from one suggested by Gomoiu; the latter used the sternocleidomastoid muscle instead of the masseter, but in other respects the two operations are practically the same.

EXTIRPATION OF THE GENICULATE GANGLION. By way of introduction to the description of Taylor's operation upon the geniculate ganglion, it would not be inappropriate to give a brief abstract of this original and very excellent piece of work by Dr. Ramsay Hunt,¹ of New York. The facial nerve must be considered as a mixed nerve with its sensory root and a ganglion similar to the sensory ganglion of the spinal nerves and those of the mixed cerebral nerves. This ganglion—the geniculate ganglion—lies in the depth of the auditory canal at the entrance to the Fallopian duct, the sensory root lying between the facial and the auditory nerve. It enters into the medullary substance between the roots of the seventh and eighth cranial nerves, and terminates in a way similar to the sensory roots of the glossopharyngeal and pneumogastric. In the distal end of the geniculate ganglion certain fibers run into the superficial petrosal nerve and to Meckel's ganglion, which, again, gives off fibers to the tympanic plexus. The sensory fibers run through the lesser superficial petrosal to the central ganglion and through the lesser deep petrosal to the tympanic plexus. Other sensory fibers pass with the motor branch of the facial into the Fallopian duct. They consist in part of fibers of the chorda tympani and supply sensation and taste, and in part of fibers to the geniculate ganglion, which pass to the outer and inner surface of the auricle. While in the lower animals the sensory portion of the facial nerve is the greater in the process of evolution, the motor elements seem to predominate, but there is still a definite sensory distribution in the middle ear which continues to the mastoid process, the Eustachian tube, and a portion of the external ear.

The existence of the sensory system in the facial nerve has its clinical expression in an *herpetic inflammation*, which Hunt has found as corresponding to the distribution of the nerves from the geniculate ganglion. It presents the syndrome of the typical herpes zoster. The boundaries of this zoster zone are the external meatus, concha, tragus, antitragus, antihelix, and lobulus. Ordinarily associated with the zoster symptoms is a facial paralysis, and in some cases some involvement of the acoustic nerve. In addition to this inflammatory affection there is also a neuralgic affection attributable to a lesion of the sensory fibers of the facial nerve. Of this condition Hunt recognizes four different types: (1) Primary idiopathic otalgia (the tic douloureux of the ear); (2) a reflex otalgia with ulcerative condition of the mouth and pharynx, which

¹ Lancet, 1909.

originates in the distribution of the trigeminus, from which fibers pass to the geniculate ganglion through the larger and smaller superficial petrosal nerve; (3) secondary otalgia from involvement of the geniculate ganglion by tumor formation; and (4) tabetic otalgia. To surgeons the important features of this sensory syndrome, which Hunt has established in connection with the facial nerve, is the possibility of operating for its relief. He goes so far as to recommend the removal of the geniculate ganglion in cases which do not respond to other forms of treatment, and it was in accordance with this suggestion that Clark and Taylor performed the operation about to be recorded.

Clark and Taylor's¹ patient was a married woman, aged twenty-eight years, who, two years before operation, began to have intermittent, paroxysmal pain in the front of the left ear, arising from no apparent cause. At first this pain only occurred about once a week, later appearing daily, and being of a typical neuralgic type. Eight months after its onset the pain had so increased that in addition to the pain in front of the ear there was also a persistent pain deep on the anterior wall of the auditory meatus, and the patient was taking twelve or more grains of morphine a day without relief. After all other treatment and examinations had proved to be negative, a diagnosis of true tic douloureux of the geniculate system of the facial nerve was made, and a physiological extirpation of the ganglion advised.

At the operation, which was done with the patient under ether anesthesia and in the prone position, an osteoplastic flap, extending from just inside the mid-line to the posterior border of the left mastoid, and from about 2 cm. above the lateral sinus well down to the foramen magnum, was reflected. The dura which was tense was incised, and the cerebellum immediately protruded. The cerebellum was then retracted until the cerebrospinal fluid at the base of the brain escaped and the nerve field was exposed. Lying just above the ninth, tenth, and eleventh cranial nerves as they pass through their foramen, and a little to the inner side, was the internal auditory meatus, and at this point the seventh, the pars intermedia, and the upper fasciculus of the right nerve were cut. The dura was closed and the flap replaced and sutured.

Taylor gives as his reason for doing such a wide division of the nerves, that while most of the sensory fibers run in the pars intermedia, there may be some which run with the facial and the upper part of the auditory nerve, and as this was the first operation of its kind ever done, it was essential that no sensory fibers remained uncut. Immediately following the operation the pain ceased, and the wound healed by first intention. For the first few days there was absolute deafness in the left ear, but at the end of ten days the hearing was restored to normal. Five weeks after the operation the facial paralysis was much less noticeable.

¹ Journal of the American Medical Association, vol. liii, No. 26.

For the first six days any attempt to turn the head to the left side was followed by vomiting; this, however, gradually disappeared. When seen five months later the patient was in the best of health, there was no pain in the ear, no cerebellar ataxia, and the facial paralysis was greatly improved.

One of the most important features of the whole operation Taylor considers to be the relation of the line of section to the trophic centres of the nerves involved. The division of the motor portion of the nerve took place between its trophic centre (geniculate ganglion) and the periphery, and therefore spontaneous regeneration with return of power should be expected. The pars intermedia being divided between its trophic centre and the brain, an ascending degeneration of the fibers should occur and the relief from the operation should be permanent.

THE BRAIN.

Brain Tumors. THE HYPOPHYSIS. With each succeeding year the hypophysis has received more and more attention not only in the experimental laboratory, but in the surgical clinic.

The first attempt to remove the hypophysis was made by Caton and Paul in 1893; it was unsuccessful, and Schloffer is credited with the first successful removal of a hypophyseal tumor.¹ In that year also several articles were published dealing with the technique of the operation for exposure of the hypophysis, notably those by Moschowitz, Braun, and Hartley.

Von Eiselsberg² seems to have had by far the largest experience in surgery of the hypophysis, and has had the rather remarkable record of having had 4 of his 5 cases recover from the effects of the operation. To those who are especially interested in this subject, we refer them to the original article, in which they will find complete description of this most interesting series of cases.

Of the three routes which have been used to reach the hypophysis, the trans-sphenoidal of Schloffer seems to be the one most highly advocated at the present time and the one which von Eiselsberg used in his cases. Before leaving this question of selection of the best route to the hypophysis, we may refer to Hochenegg's article,³ which points out that different routes should be used under different circumstances, and for this purpose he divided the cases of hypophyseal tumor into three classes: (a) Relatively small tumors lying in the sella turcica, covered above with a bridge of dura; these can be removed entirely

¹ PROGRESSIVE MEDICINE, March, 1907.

² Wiener klin. Wochenschrift, No. 18, 1909.

³ Deutsche Zeit. f. Chirurg., vol. c, p. 307.

by the nasal route. (b) Tumors filling the sella turcica, but growing chiefly endocranially; these can be partially removed, and the symptoms due to the pressure relieved, though not the symptoms of acromegaly. (c) Cases in which the major part of the tumor lies endocranially, in which the operation does only harm.

Hecht¹ regards the intracranial method as difficult, dangerous, and uncertain, and the oral route he says gave a very poor exposure of the region, and because of the direct communication with the buccal cavity is almost invariably followed by infection.

One of the most valuable diagnostic aids in the detection of hypophyseal tumors are the *x*-rays. Church² reports six cases in which the diagnosis was made by this means; in every instance the tumor was most accurately defined. In his study of this subject he finds that when a tumor of the hypophysis does not produce acromegaly it usually stunts the growth and especially the sexual development, while the mentality is not always affected.

This view is upheld by Maeburg,³ who claims that it is hyperfunction of the pituitary gland, which results in acromegaly, while hypofunction produces a general adiposity with genital atrophy.

Hecht⁴ finds from an exhaustive review of the literature on tumors of the hypophysis that while these growths are rare, they are by no means as scarce as many consider them to be. As a rule, such tumors are slow in their growth and fairly benign in character, while in size they may vary from a small seed to that of a pea, and occasionally sarcomata, the size of a hen's egg, have been reported. That a tumor of the pituitary may be present without causing acromegaly is now well known, just as it is known that acromegaly may be present without any demonstrable lesion of this body. In Hecht's series he found that the eye symptoms were the most positive diagnostic features in tumors of this region, and in almost all the cases the disturbance of vision was very marked, often terminating in unilateral or bilateral blindness.

It is now well known that there is a close relationship between all the ductless glands of the body, in support of which Thumim⁵ reports a case of hypophyseal tumor with well-marked symptoms of acromegaly, in which the first symptom was the cessation of the menses, and at the same time he mentions a case of von Eiselsberg's in which the menses returned after the removal of a hypophyseal tumor.

Laboratory workers have known for a long while that the total removal of the pituitary body invariably terminates fatally, and Cushing and

¹ Journal of Nervous and Mental Disease, November, 1909.

² Journal of the American Medical Association, July 1, 1909.

³ Deutsch. Zeit. f. Nervenheilkunde, December, 1908.

⁴ Journal of Nervous and Mental Disease, November, 1909.

⁵ Berliner klinische Wochenschrift, April 5, 1909.

Redford's¹ experience was no exception to the rule. Their experiments corroborate what Paulesso had found, namely, that the mere separation of the hypophyseal stalk from the infundibulum is equivalent to the complete removal of the gland; that when the gland has been entirely removed, death results in the course of a few days, with a peculiar train of symptoms. If the posterior or nervous portion of the gland be alone removed, it is not followed by any particularly characteristic symptoms, but if the anterior or glandular portion be even partially removed, it leads to profound alterations.² Therefore, great care must be taken, when operative interference with the pituitary is necessary, to leave a portion at least of the anterior part of the gland.

I direct the attention of those who may be especially interested in the surgery of the hypophysis to an admirable review of the subject by Proust.³ From a careful review of the literature upon operations on the pituitary he divides the various methods of approaching the gland into two divisions—the intracranial and extracranial. By the intracranial route the gland may be reached either through the temporal or through the frontal region, Horsley being one of the first to advocate the temporal, while Kiliani favored the frontal approach. The intracranial methods all present the same difficulties, however, and have fallen into disfavor. By using either the temporal or frontal route much difficulty is experienced in reaching the hypophysis, which here lies deeply and is most intimately surrounded by a number of vital structures which it is most difficult to avoid, for from the temporal side the carotid artery and the cavernous sinus are in close proximity to the gland while from the frontal aspect the gland is protected by the cavernous sinus and the optic chiasm. In order to reach the pituitary, the brain must be retracted to a considerable degree and for a considerable length of time, and injury to the brain is very apt to occur. For these reasons the intracranial operation has been abandoned for one of the extracranial routes.

Of the extracranial or trans-sphenoidal operations, there are three which have been advocated: the bucconasal, the intermaxillary, and the nasal method. By the bucconasal approach the surgeon has to go up through the hard palate and through the nose, and though this method of reaching the gland in animals is fairly simple, it is much more difficult in the human, and the danger of infection arising from the mouth is so great that it, too, is no longer considered. The intermaxillary route is also open to the same objections. The nasal approach, however, is the one which has come into general use at the present time, and was first described by Schloffer and reviewed by me

¹ Johns Hopkins Medical Bulletin, April, 1909.

² Journal of the American Medical Association, July 24, 1909.

³ Journal de Chirurgie, 1908, vol. i.

in March, 1907. Since then there have been many modifications, but the essential features remain the same. The danger of infection in these cases from the nose, which one would consider most liable to occur, in reality happens but rarely (Figs. 1, 2, and 3).

Schloffer's patient was thirty years old and had suffered for six years from headaches and signs of acromegaly. The *x*-rays showed an enlargement the size of a nut in the pituitary region. A portion of the growth was removed and proved to be an adenoma. The headaches

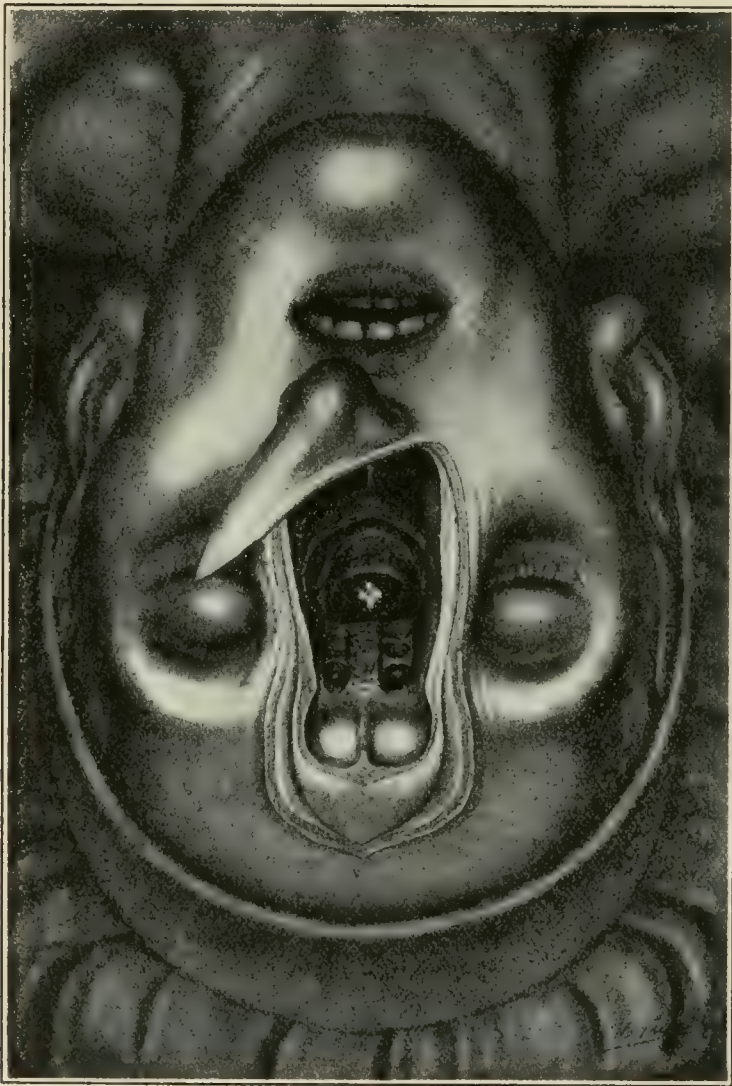


FIG. 1

disappeared and the patient made a good recovery. Two and one-half months later he died, and the autopsy revealed a condition of internal hydrocephalus from the closing off of the ventricle by the tumor, which was much larger than was suspected.

Von Eiselsberg¹ has operated upon five cases by the Schloffer method, with but one death.

¹ Wiener klin. Wochenschrift, 1907, No. 21; 1909, No. 8.

CASE I.—The patient, a man, aged twenty years, had marked headache and optic atrophy. There was also pronounced obesity, with infantile genitalia and loss of sexual appetite. The *x*-rays revealed the presence of a tumor. At the operation a cystic tumor which proved to be an epithelioma was partially removed. A year later the patient was in much better health than before the operation. He had no headache, and his vision was improved. There was also a diminution in the obesity and some return of sexual power.

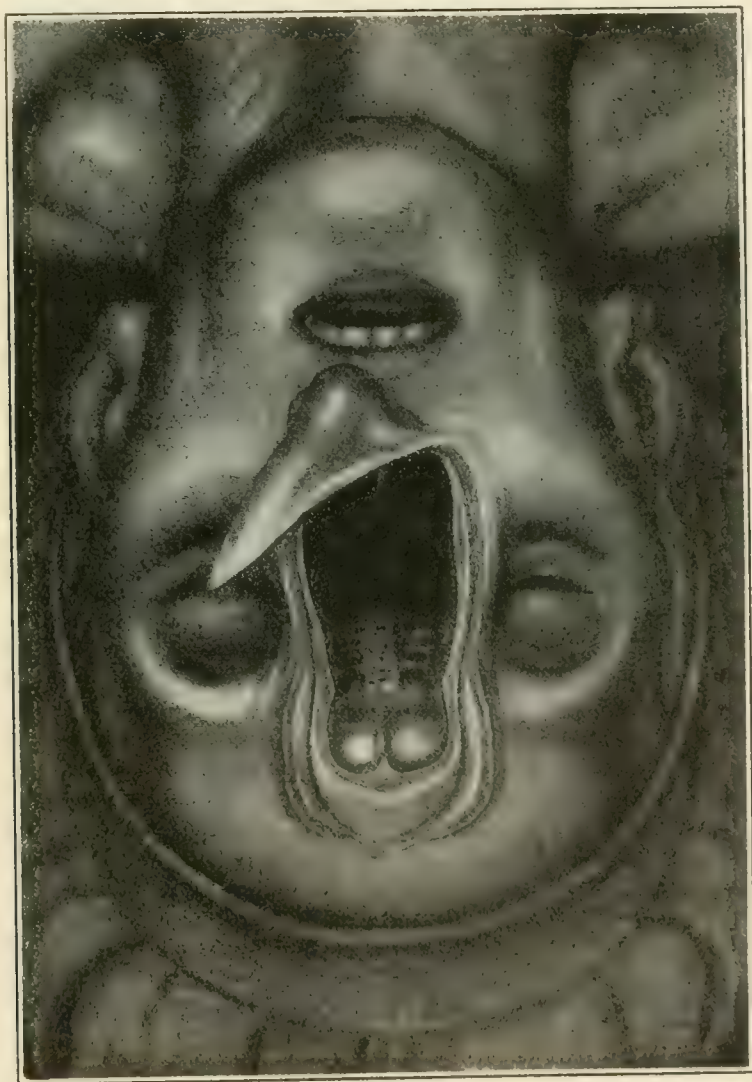


FIG. 2

CASE II.—A woman, aged thirty-three years, for a number of years had noted an increase in the size of her hands, feet, and face. She also had a bitemporal hemianopsia. The *x*-rays showed a tumor. At operation a sarcoma was removed, but the patient died forty-eight hours later of meningitis.

CASE III.—A man, aged twenty-seven years, had violent headaches, and there was a bitemporal hemianopsia. There was marked obesity and a noted absence of hair from the body. The *x*-rays revealed a tumor. Upon reaching the pituitary a soft fluid-containing mass was

removed which turned out to be an angiosarcoma. Six months later the patient was well in every respect and had no headaches.

CASE IV.—A girl, aged sixteen years, complained of unbearable headache and some visual disturbances. She had never menstruated. Upon operating, a cyst was found and removed. The girl made a good recovery and was cured of her headache, and after the operation began to menstruate.

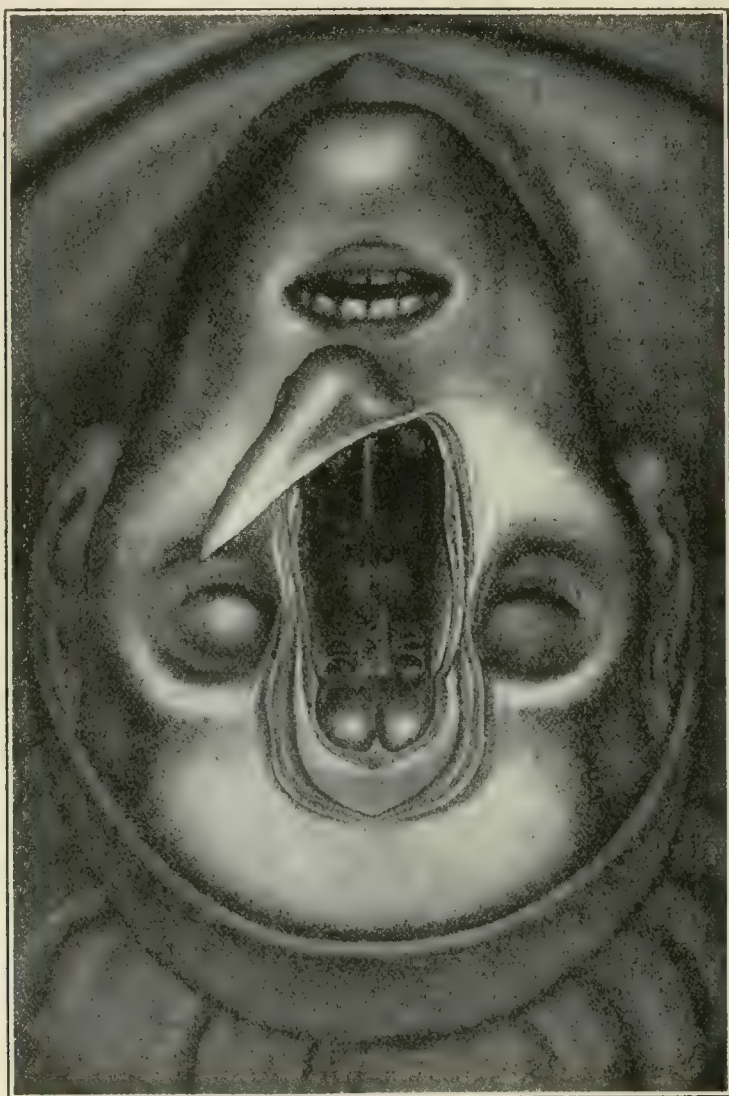


FIG. 3

CASE V.—A man, aged thirty-six years, had severe headache and subjective and objective interference with his eyesight. The tumor, which proved to be an epithelioma, was found and removed in fragments.

Hochenegg¹ operated upon a woman, aged thirty years, who had severe headaches and typical acromegaly. He also used the nasal route, and removed the whole of the tumor in fragments. It proved to be an adenoma. The patient made an uneventful recovery; the

¹ Loc. cit.

headache entirely disappeared, eyesight was restored, and there was marked diminution in the acromegaly.

Borchardt's case not only recovered from the operation, but was entirely relieved of his symptoms. From these cases it will be seen that the operation, undertaken by this route, is not a particularly dangerous one and that the results fully justify the procedure.

Kocher¹ reports a case which was successfully operated upon for a hypophyseal tumor, dying later from increased intracranial pressure. His patient, a woman, came to him with a history of having had a hard fall, landing upon the buttocks. Following this she had persistent headache, to which for a while she paid but little attention, however, as she had suffered frequently from headache before the accident. She further complained of weakness in the limbs, which gradually became more marked. Vomiting was frequent. Her menses, which up to the time of her fall had been perfectly regular, in the succeeding months gradually decreased in amount until they finally ceased.

Some six months after the accident (from which the patient dates her illness) she noticed a feeling in her hands as though ants were crawling over them, which gradually increased until she had severe pain. When these attacks of pain appeared in her hands they would become greatly swollen. About a year after the commencement of her trouble she noticed that her hands and feet were enlarged, disturbances of vision developed, and a severe glycosuria appeared. Upon examination, it was found that she had a bilateral hemianopsia with papilledema of both disks. The *x*-ray photograph of the skull showed very plainly a widening of the sella turcica toward the pharynx and also posteriorly.

At the time of operation Kocher chose the nasal route, but as he departed somewhat from the method as advocated by Schloffer, I will describe the operation in some detail:

With the patient under ether narcosis the posterior nares were tamponaded; though the patient was in a semi-erect posture, this prevented any blood from entering the pharynx. An inverted Y-incision was then made across the base of the nose (Fig. 4), well into the eyebrows, from the centre of which an incision extended down the middle of the nose to the junction of the nasal cartilage. From this point two lateral incisions were continued above the line of juncture of the nasal cartilages. The cartilages were then separated, permitting the cartilaginous portion of the nose to be turned downward. After cutting through the septum the nasal bones were separated along their juncture and the frontal process of the maxilla was separated from the frontal to the lacrymal bone. The base of the frontal process was finally cut through from the apertura pyriformis upward and outward to the tear duct. The two osteoplastic flaps were then reflected, exposing

¹ Deutsch. Zeit. f. Chir., Band 6

the interior of the nose. When the entire bony septum had been removed, after separating the mucosa on both sides, instead of removing the turbinates, as other surgeons have advocated, Kocher pressed them apart with a special speculum, thus obtaining the same exposure, but with relatively little bleeding. With a long straight rongeur the base of the septum and the underlying bone were removed, at the same time opening the sella turcica. This opening was enlarged and the edges pressed back with an elevator until an opening the size of a dove's egg was obtained, through which the soft tumor was removed with a spoon



FIG. 4

curette. The cavity was drained with iodoform gauze led out through the nostrils. Except for an unusually rapid pulse, 140, which continued for six days, the postoperative course was uneventful. Her symptoms disappeared and there was a marked decrease in the size of her hands and feet. Twenty-four days later the patient died very suddenly, and the autopsy revealed a round-cell sarcoma, involving the cavernous sinus and the bone. A persistent thymus was also found.

Cushing¹ reports the case of a man, aged thirty-eight years, upon whom he did a partial hypophysectomy for acromegaly. At the operation, which was done with the patient under ether anesthesia, a preliminary tracheotomy was performed, chiefly on account of the large size of the tongue, and warmed ether vapor was administered through

¹ *Annals of Surgery*, vol. 1, No. 6.

the tracheotomy tube. The patient was placed in the Rose position and the posterior nares occluded by a sea sponge. The approach to the tumor was made by an omega-shaped incision over the region of the frontal sinuses, and continued down along each side of the nose to the lower margin of the nasal bones. At the outer side of each frontal sinus a small opening was made with a burr, and by means of a Gigli saw the upper edge of the sinus flap was cut from within outward. Continuing the lateral incision of the frontonasal flap to the inferior margin of the nasal bones, the median septum was then divided and the whole flap with the overlying soft parts reflected downward. This being done the ethmoidal cells were rongeured away until a mesial channel was made just below the ethmoidal roof back to the posterior portion of the nasal fossa. Upon breaking through the anterior wall of the sphenoidal cells the sella turcica was seen projecting in the upper posterior portion. After clipping away the thin overlying shell of bone, the dural covering of the pituitary was exposed. The dura, which was very tense, was incised, and about one-half of the gland was gradually removed by a curette. Two small drains were placed from the sphenoidal region through each nostril and the frontonasal flap replaced and sutured.

The postoperative course was uneventful, and on the third day the last drain was removed, and there was practically no nasal discharge. Immediately following the operation there was improvement in the symptoms, with permanent disappearance of the headache. During the seventeen days in which the patient remained in the hospital following the operation his hands and feet became much less stiff, and there was marked wrinkling of the skin, while the thickening of the tissues was much less marked. The photophobia had practically disappeared. There was a complete loss of the olfactory sense.

Leischner¹ records in some detail all the cases of brain tumor which have been operated upon in the past six years in the clinic of von Eiselsberg. The greater portion of the article would be of more interest to the neurologist than the surgeon, as in the records of the individual cases the details as to the operation are very meagre. The latter part of the article he devotes to a discussion of certain technical matters, and among other things he calls attention to the fatal cases, which he attributed to an injection of morphine prior to the operation. The danger of using morphine in operations on patients with cerebral lesions is well known and has been commented upon at various times. I have always felt that it was particularly dangerous in patients with subtentorial lesions, and have made it a routine practice not to administer morphine in this group of cases. I have never, however; had any unpleasant experience, and do not prohibit the use of

¹ Arch. klin. f. Chirur., Band lxxxix, Heft 3.

morphine when the lesion is in front of the tentorium. However, there are others whose experience seems quite at variance with mine. Thus, Schuster reported the death in three cases of inoperable brain tumors following a short time after a small dose of morphine. Hartman in a case of brain abscess saw the patient die of respiratory failure after the administration of morphine.

The results obtained in von Eiselsberg's clinic were on the whole most discouraging, and Leischner is inclined to be rather skeptical as to the somewhat rosy accounts from other clinics. Of the 23 cases forming the basis of the report, the diagnosis was accurate in 18. The mortality was 23 per cent., and of the 10 fatal cases 3 died of shock, 2 of pneumonia, 3 of meningitis, 1 of embolism, and 1 of respiratory failure following the use of morphine. Of the 12 cases in which tumors were removed and the patients survived the operation, 6 died within four months, 1 was in no way improved three months after the operation, and the remainder only for a short time improved.

Except for the relief from headache and vomiting there was practically no favorable results following the removal of the tumor.

Taking it altogether, this article is without question the most discouraging of any that have recently appeared upon the subject of brain surgery. There has been a general feeling that with the improvement in technique and the greater accuracy in localization the results of operations on brain tumors justify the time and attention which have been given of late to this field. But the greater our experience the more confident do we become, that the percentage of operable tumors is not large, probably less than 10 per cent. So that in the great majority of cases a radical operation is not indicated, but may be distinctly contraindicated. In looking over this report from von Eiselsberg's clinic the thought has occurred to me that perhaps the high mortality may be due to the fact that a certain number of tumors were removed which should have been left alone. In other words, in a certain number of cases a radical operation should not have been undertaken.

It has been my experience that ineffectual attempts to remove, strictly speaking, inoperable tumors are more apt to be followed by an extremely rapid recurrence and growth, and for this reason I have always been extremely conservative even after the tumor has been exposed and is quite accessible. If we are right in assuming that a good many of Leischner's cases were of the inoperable kind, and should therefore had had a decompressive and not a radical operation, the mortality would have been lower, the relief from subjective symptoms quite as great, and the life of the subject after the operation as long, if not longer.

Trauma and Brain Tumors. The belief once prevalent that tumors of the brain were but of relatively rare occurrence is now maintained but by few, though there is probably no disease in which the symptoms are so apt to be overlooked or so incorrectly interpreted, or in which an early diagnosis is so important.

The question as to whether cerebral tumors should be considered the result of trauma or not has been carefully gone into by Smith,¹ who finds that the percentage of cases which can be traced directly to trauma varies from 2.5 to 44 per cent., and from his review of the literature on this subject he has reached the conclusion that: (1) Under certain conditions a tumor, particularly a sarcoma, may be regarded as of traumatic origin; (2) that the exact role played by the trauma has not been satisfactorily explained; (3) that the conditions under which any given tumor is to be regarded as post-traumatic in origin are not definitely established. As to how long after a trauma a tumor may be regarded as post-traumatic in origin can only be decided by a careful study of each individual case.

Tumor of Frontal Lobe. Ruckert² reports a most interesting case, which was thought to be either a cerebellar or a cerebellopontile tumor. The chief symptoms were choked disk on the left side, with palsies of the right facial nerve and progressive loss of hearing on the right side. Later, the choked disks developed in both eyes, the hearing was lost on the right side and then on the left, but with no sign of any middle-ear disease. There was also marked disturbance of equilibrium, until the patient could neither walk nor stand. The case died, and proved to be one of a round-cell sarcoma of the frontal lobes, chiefly on the right side. The acoustic disturbance could only have been due, Ruckert believes, to intracranial pressure.

Tumor in Parietal Region. An interesting phenomenon was observed by Zenner and Kramer³ while operating upon a patient with a tumor in the left parietal region. During the time that the brain and the tumor were being manipulated the pulse on the right side entirely disappeared, while on the left it remained normal. The next day the pulse was normal on both sides, but at a second operation, undertaken for the removal of the tumor, the same phenomenon was observed.

Brain Tumors in Children. Brain tumors are relatively common in children, but still more striking is the predominance of *cerebellar tumors*. This has been shown by Berthaux and Burner,⁴ who have collected 56 operative cases of cerebellar tumors diagnosed during childhood. In the cases of tubercle in the cerebellum all died with the exception of one boy, who was cured by the removal of a somewhat irregular tubercle from the left cerebellar lobe. In 13 cases of cerebellar cysts, all but one recovered after the removal of the cyst; 5 out of 17 cases of glioma recovered, though in one the growth returned later. Of 9 cases of fibrosarcoma, 2 recovered after the removal of the

¹ Surgery, Gynecology, and Obstetrics, April, 1909.

² Berliner klinische Wochenschrift, July 5, 1909.

³ New York Medical Journal, October 2, 1909.

⁴ Archiv. Générales de Chir., Paris, tome iii, No. 27.

growth, the remainder dying soon after the operation. In 4 cases of suspected tumor, one of the patients died from hemorrhage.

Puncture of the Brain. Though apparently looked upon with favor by many German surgeons, puncture of the brain as a diagnostic procedure has not gained a foothold in this country; an exploratory craniotomy is to be preferred in all doubtful cases. Forster,¹ however, advocates (1) the performance of an exploratory puncture in all cases in which there is doubt as to the diagnosis of the location of the tumor, in all cases where the tumor is inoperable and a palliative operation cannot be considered, and in those cases where the differential diagnosis is doubtful, and in which death is to be expected in case nothing is done. (2) The puncture must be done only after the tumor has been accurately localized; when this cannot be done, the least important area of the brain, beginning with the right frontal lobe, should be examined first. (3) When the result of puncture shows the brain to be normal, an operation is contra-indicated. (4) Puncture should not be done in cases of *abscess*, unless they are tuberculous, because of the danger of spreading infection.

Even in cases of brain abscess Kuttner² considers a Weisser puncture to be a most valuable diagnostic aid, and in the event of an abscess being detected, everything should be in readiness for an immediate operation.

Borchardt³ is also strongly in favor of this method of diagnosis when all others have failed, but he cautions us to bear in mind the ever-present danger of injuring some bloodvessel during the operation, an accident not only dangerous from the standpoint of hemorrhage, but also because, in some cases, a very slight increase in intracranial pressure may cause death. Of 26 cases with cerebral lesions, he resorted to puncture in 8. In these he failed only twice, once because the cannula was clogged with normal tissue, and again because it was not carried out sufficiently extensively.

Surgery of the Cerebellum. In a contribution to the surgery of the posterior cranial fossa, Elsberg⁴ reviews the surgical anatomy of the parts concerned in the approach to the cerebellum. As to whether a bilateral exposure of both lobes of the cerebellum is indicated in every case, he takes the view, which I have maintained, that it is only necessary in cases in which the lesion is bilateral or in the vermis. If the bone is removed well above the superior curved line of the occiput, well into the mastoid, and up to or across the median line, the exposure of the cerebellar lobe is sufficient for all purposes. Furthermore, for decompressive purposes, a unilateral opening is quite sufficient. He believes,

¹ Berliner klin. Wochen., Band xlvi, No. 1.

² Deutsche med. Wochen., Band xxxv, No. 11.

³ Berliner klin. Wochen., Band xlvi, No. 29.

⁴ Surgery, Gynecology, and Obstetrics, October, 1909.

further, that the constant control of the general blood pressure, during an operation, in the posterior fossa, is of much value and should never be omitted. He agrees with Horsley that chloroform is preferable to ether because there is less hemorrhage and less bulging of one cerebellum when the dura is incised. Drainage is not necessary in the majority of cases, and he recommends, as an almost invariable rule, the closure of the dura as completely as possible and the skin wound entirely. In this I cannot, however, agree with him; when there is much increased intracranial tension it is often not only impossible but inadvisable to completely close the dural wound, and the complete closure of the skin wound, without drainage, will be followed in most instances by the accumulation of more or less blood, which should have been drained off. To control bleeding he uses a hemostatic suture, as suggested by Haidenhain, extending from the tip of one mastoid process to the other, crossing the median line about one inch above the external occipital protuberance. In unilateral suboccipital craniotomy he prefers the lateral posture with the head moderately flexed on the thorax, and for bilateral exposures the patient is placed flat upon the abdomen with the head projecting beyond the end of the table and resting on a special head attachment.

One of the most important points, I believe, in the technique of suboccipital craniectomies, and one upon which stress is often not sufficiently laid, is the method of making the flaps; incisions should be made in such a way that when sutured there is little chance of the establishment of a permanent sinus. After these operations a considerable amount of cerebrospinal fluid will escape from the wound, and this interferes, to a certain degree, with repair of the wound. As a precautionary measure, therefore, it is advisable to make the incisions in the skin at least one-half inch to the outer side of the incision in the aponeurosis, so that the two do not overlap each other. Not only is the continuous escape of a large quantity of cerebrospinal fluid a serious matter in itself, but so long as there is any communication between the surface and the cerebellum there will always be danger of infection.

After a large and somewhat varied experience with exploratory operations in the posterior fossa, I¹ have formulated certain definite conclusions. They are as follows: (1) Generally speaking, exploratory operations and decompressive operations in the posterior cranial fossa are fraught with more risks to the patient than are those in any other part of the brain; a certain percentage of patients will die while under observation, or just as the anesthetic is begun, or when convalescence seems well established, apparently irrespective of operation. Those deaths are usually sudden, not forewarned, and are due to central disturbance of the respiratory apparatus. By artificial respiration I have

¹ Journal of the American Medical Association, 1909.

seen the life of the patient sustained for eighteen hours, but the respiratory centre never resumed its function. (2) If, added to exploration, an attempt is made to remove the tumor, the risks of operation are increased to such a degree that I consider such attempts, where the tumors are malignant and adherent to adjacent structures, as absolutely unjustifiable. This statement refers particularly to the tumors of the cerebellopontile angle and to the malignant type, especially the endotheliomata. There may be instances, as in the encapsulated types of fibrosarcoma, or, of course, in the benign fibroma of the auditory nerve, when removal is quite feasible and may be curative in its effect. (3) The great majority of tumors are situated in the pontile angle—at least, if my experience does not differ very radically from that of other operators. To express this relative frequency more definitely, I should say that in my whole series of exploratory operations for subtentorial lesions there was but a single case in which the tumor was discovered in the substance of either cerebellar hemisphere. (4) While assuming a skeptical attitude regarding the operability, so to speak, of tumors in this region, I am most optimistic as to the results of decompression. In the subtentorial, more than in the pretentorial, lesion is decompression clearly indicated once the diagnosis is made. Papilledema is so much more constant and optic atrophy so inevitable a sequel that, apart from other considerations, operation should have been resorted to as a rule, months before the patient is brought to the surgeon. (5) Lumbar puncture, either as a diagnostic or therapeutic measure, should never be resorted to. The number of fatalities from this apparently harmless procedure are so great as to make it absolutely prohibitive. I am speaking now chiefly from the observations of others as recorded in literature, as I have in but one instance ventured to practise it, and then only after a decompressive operation had been performed. In this case the effects, while not alarming, were most distressing. For forty-eight hours the patient had a violent headache and a peculiar vasomotor disturbance, which manifested itself in a deep red flush of the cutaneous surface of the neck down to the level of the clavicles, quite symmetrical and sharply defined. This manifestation of vasomotor disturbance was quite unique in my experience, although the circulatory irregularities which one sees not infrequently in cerebellar lesions are, in all probability, due as much to disturbance of the vasomotor as of the cardiac centre.

Papilledema. I would advise those who may be especially interested in papilledema as dependent upon increased intracranial tension and its possible relief by surgical intervention to consult a recent contribution by Drs. de Schweinitz and Holloway.¹ In this contribution (the most modern treatise upon this subject) will be found among other things a carefully compiled statistics giving the examinations of the eye

¹ Therapeutic Gazette, July 15, 1909.

before and after 212 operations. One of the most important parts of the article is given over to the description of the appearances of the nerve-head which indicated operative intervention; another to the nerve-head changes and factors which determine them; and still another to the effects of operative procedure upon the papilledema. While the article contains a good deal that may be of interest chiefly to the specialist, there is also much that should prove interesting as well as instructive to the general practitioner and surgeon.

There has been some discussion as to the etiology of papilledema in its relation to brain tumors and as to its significance in the presence of cerebral trauma. In an article read before the Section on Ophthalmology of the American Medical Association, I¹ called attention to a number of observations which had been made in the Laboratory of Experimental Surgery of the University of Pennsylvania, in collaboration with Drs. de Schweinitz, Sweet, Prime, and Holloway. These observations were based upon a series of experiments conducted in such a way as to reproduce, as far as possible, the conditions of which papilledema is an associated symptom; such, for example, as brain tumor on the one hand and cerebral contusion on the other.

From these experiments we felt justified in drawing conclusions which might be expressed as follows: (1) Increase of intracranial tension by artificial means up to a point attended with profound disturbance of the circulatory and respiratory functions was in no instance attended with development of a papilledema, except in two instances not here recorded, and in these there was no marked swelling of the disk, but only a slight edema and filling in of the centre of the disks. (2) The duration of the observation varied from two to ten hours; in one instance increased intracranial tension was maintained and observations made from 6 P.M. to 4 A.M. the next day. So that the element of time did not affect the results. (3) In some instances the eyegrounds were bleached (the stage of anemia), and in many there was more or less fulness and occasionally pulsation of the retinal veins, but nothing else. (4) The degree of intracranial tension artificially produced in these experiments exceeded by far that which obtains in the vast majority of these lesions, of which papilledema is a clinical manifestation. (5) Therefore, in the etiology of papilledema some factor or factors other than increased intracranial tension play an important part. (6) What these may be is still a matter of conjecture.

As to the relation of papilledema to intracranial trauma, it has been said that one is a more or less constant accompaniment of the other, at least in those cases of intracranial trauma in which there is some obstruction to the venous circulation, as in the stage of *stauungs hyperemie*. These include cases of cerebral contusion in which edema is a con-

¹ Journal of the American Medical Association, September 11, 1909.

spicuous feature, although it might include also cases of large intracranial hemorrhage. For several years Dr. de Schweinitz has examined almost all the cases of this description in my service at the University Hospital, and in only two cases has he discovered any papilledema. It has been observed, further, and this has direct bearing not only on the etiology, but on the question of operative interference, that a high-grade papilledema may subside spontaneously a very short time after its appearance, and, furthermore, we may have a very marked papilledema even though there may be no symptoms of a serious intracranial lesion.

In the paper above referred to the question of the relation of papilledema to the size, situation, duration, and nature of the tumor was touched upon, and in an analysis of 19 cases it was found that in the majority the measurements were rather uniform, irrespective of the duration, the nature, or the size of the tumor. In most of the cases there was a uniform elevation of $+3$ or $+4$ diopters.

Hydrocephalus is still the *bête noire* in the surgery of the nervous system. In fact, so far as results go, one might almost say at the present time that it should not be regarded as presenting any surgical indications. The most ingenious methods have been devised and every system of drainage instituted without appreciable permanent results, and with but few exceptions with an almost prohibitive mortality. The ventricles have been drained directly into the subdural space, into the cellular tissues of the scalp, into the subaponeurotic space, into the cellular tissue in the lumbar region, into the retroperitoneal space or abdominal cavity, into the longitudinal sinus, into the jugular vein, and into the plural cavity. Are there any other cavities or systems into which the ventricles could be drained? And yet this problem seems to have a certain fascination for certain of the profession, for year after year we find some new and interesting contribution to this subject. The condition is otherwise so utterly hopeless, the subject so frequently defective, if it survives the period of early childhood, that there is every incentive for further investigations along these or other lines.

I wish to record an operation as yet unreported which was performed by my assistant, Dr. Prime, in which both the subdural and the ventricular spaces were drained into the jugular vein. Dr. Prime's idea of combining subdural with ventricular drainage, although quite feasible and based upon sound reasoning, is, so far as I know, quite original.

A fresh jugular vein with a branch coming off as a Y was removed from a dog and was kept moist in normal salt solution until used. The jugular vein of the child was then exposed and the lower end of the Y vein was sutured to it by an end-to-side anastomosis. When this was completed an osteoplastic flap was reflected in the temporal region and a blunt dissection made through the muscles and fascia from the base of the flap to the point of anastomosis with the jugular. The

free end of the dog's jugular was then drawn up through this tract, no tension being made upon it, and laid upon the dura. A small opening was then made in the dura, through which a cannula was passed into the lateral ventricle, and with it one of the branches of the vein. This was left free in the ventricle in the hope that some fluid might find its way out through the vein, and if not, then along its side into the subdural space. The other branch of the vein was then sutured to the margin of the dural opening. After the anastomosis was effected the cerebrospinal fluid began to flow through the vein. The bone flap was reflected, a small opening being made at its lower margin to permit the passage of the vein, and the scalp closed. The child recovered promptly from the operation and did well for about eighteen hours, the fontanelles no longer bulging, and with every evidence of drainage being effectual. At the end of this time, however, the temperature began to rise alarmingly, and the child died, as do the majority of cases, at the end of thirty hours from some thermal disturbance. At autopsy there was no sign of infection and the vein was perfectly patulous.

McClure¹ reports a case of hydrocephalus in which he drained the subdural space in the cerebellar region with a section of vein removed from the arm of the child's father. At the operation the posterior fossa was opened and a horseshoe-shaped flap of the dura reflected. A small hole was then made in the centre of this dural flap just large enough to admit the end of the excised vein, the edges of which were everted and sewed to the inside of the dura. The dural flap was then carefully replaced and sewed. When this was finished a channel was made by a blunt dissection down to the jugular vein. Through this tract the newly obtained vein was drawn and an end-to-end anastomosis effected with the jugular vein. The child died a few hours later.

Payer's method, described in detail last year, has not met with general favor; not only is it exceedingly complicated, but there is the added danger of sinus thrombosis.

Von Bramann² has abandoned the use of ventricular and lumbar puncture in these cases on account of the danger of infection, which is so apt to occur with constant repetition, and follows a method suggested by Anton. The results he reports as encouraging. The skull is opened with a large conical trephine, 1 cm. from the middle line, the anterior edge of the opening being made close to the coronary suture. The dura is reflected and the hemisphere carefully retracted, and a pliable rubber tube 2 to 3 mm. in diameter is introduced between the brain and the dura to the falx cerebri and thence along the falx down to the corpus callosum. The latter is penetrated, and when the cerebrospinal fluid has escaped the opening is enlarged by pushing the tube back

¹ Johns Hopkins Hospital Medical Bulletin, April, 1909.

² Deutsche med. Wochen., vol. xxv, No. 38.

and forth. The tube is then withdrawn and the scalp closed. This method was used altogether in 8 cases; in 3 the results were decidedly good, 2 cases died soon after operation of other causes, and there is no record of the results of the remaining 3. One case had so improved at the end of a year as to be regarded as a cure.

Cranial Trauma. FRACTURES OF THE BASE OF THE SKULL. The management of cases of basal fracture—and when we speak of basar fractures we imply those in which there has been a more or less serious contusion of the brain with corresponding encroachment on the cerebro-spinal space—is a very important one, and it is somewhat disconcerting to have so many differences of opinion. To me it has always seemed absurd to lay down any hard and fast rule which could be applicable to all. I do not believe it advisable to operate invariably in cases of basal fracture, nor do I believe that they should all be treated conservatively. The mortality of basal fractures is between 50 and 60 per cent., and I believe this mortality could be reduced by operating in selected cases; but inasmuch as so large a percentage recover spontaneously, invariable surgical intervention is obviously unnecessary, and therefore inadvisable.

If we attempt to analyze our cases, they would seem to fall naturally into three groups: (1) Those in which damage to the brain has been so great that, decompression or no decompression, the patient dies. The fatal tendencies in these cases are easily recognized, and, as a rule, the patient survives the injury but a few hours. The autopsy reveals laceration and hemorrhage in and about the brain substance. Should decompression be performed, the course of events is absolutely uninfluenced by the operation, the condition becomes progressively worse, and the patient dies a few hours later. (2) Those in which the symptoms at no time appear serious enough to threaten life. There may be complete unconsciousness or deep somnolence, slow pulse and respiration, perhaps a papill- edema and evidence of injury to some of the cranial nerves, as the oculo-motor, abducens, or facialis; the symptoms persist for several days, then show signs of abatement, and the patient recovers. (3) Those in which the patient's condition, though not desperate at first, becomes progressively more serious, the unconsciousness deepens, relaxation takes the place of restlessness, the respirations become more stertorous and Cheyne-Stokes in type, and the pulse slower; in the latter stage there may be signs of beginning breakdown of the respiratory and circulatory functions. It is in this group that cerebral decompression should be considered justifiable as a means of saving life. Whether we should decompress in the temporal or in the subtentorial region I am not prepared at the present time to say.

Vincent,¹ on the other hand, is more radical, and claims that the only

¹ *Revue de Chir.*, Paris, tome xxix, No. 8.

rational treatment is one designed to prevent the development of meningitis. This he believes can be best accomplished by trephining as soon as possible after the accident has occurred. If, in addition, the patient is in a state of shock, he considers the indication for immediate operation even stronger, as the pressure of the blood clot may cause the continuance of the shock.

Simmons¹ reports a number of interesting cases of head injuries, some of which exhibited at the time of the accident no very definite symptoms, but subsequently died and at autopsy revealed an extensive injury to the brain, with or without an accompanying fracture of the skull. So frequently are there no positive symptoms to guide one in the recognition of the precise lesion, that one should be cautious in his prognosis. Simmons inclines, however, toward the conservative treatment of basilar fractures, leaving them alone when, within a reasonable time, there is some evidence of improvement. If, on the one hand, there is no tendency toward recovery, or on the other the condition becomes more serious, the middle fossa of the skull should be opened on one side, or both sides if necessary, for decompressive purposes.

In a lengthy article Phelps² gives a very careful analytical review of 1000 cases of *head injury*. He classifies his cases as fracture of the cranial vault, fracture of the cranial base, and independent injuries of the cranial contents. His summary is as follows:

	Cases.	Recovery.	Deaths.
Fracture of base	570	259	311
Fracture of vault	213	152	61
Independent injuries without demonstrable fracture	217	130	87
	<hr/> 1000	<hr/> 541	<hr/> 459

A most noteworthy feature is the large percentage of recoveries after fractures of the base. It was found that the majority of the basilar fractures originated in the vault and were continuations of fissures which began at the point of impact and then followed the line of least resistance down to the base. Phelps contends that great confusion has been caused by the failure of the medical profession to distinguish, in cases of a cerebral injury, the symptoms of fracture from the accompanying intracranial complications. The abnormal pulse, temperature, and pupils, with loss of consciousness, which are so often considered as symptoms of the fracture, in reality indicate an intracranial lesion and occur quite independent of any injury to the skull. A proper understanding of the distinction between the symptoms of fracture and those of the concomitant cerebral or meningeal lesions is absolutely essential to accuracy in prognosis and to a proper plan of treatment.

¹ Long Island Medical Journal, March, 1909.

² Annals of Surgery, 1909.

Of the direct symptoms of fracture, Phelps finds there are but few. A fracture confined to the vault may be recognized by tactile or visual sense, and if there is any doubt remaining, or if suspicious symptoms arise, there should be no hesitancy in cutting down and examining the surface of the skull. In the majority of basilar fractures, the symptom upon which the greatest reliance can be placed is cranial or intracranial hemorrhage. In 405 cases he found:

	Cases.	Recoveries.	Deaths.
Hemorrhage from the ear	285	166	119
Hemorrhage from the nose or throat	90	39	51
Subconjunctival hemorrhage	17	9	8
Subcutaneous hemorrhage	13	3	10

A careful consideration of the variations of temperature, in connection with the phenomena of consciousness, may point directly to the nature and extent of the lesion, and should be considered the most positive indication of an intracranial injury, and usually a severe one.

Primary temperature.	Fatal.	Recoveries.	Highest temperature.	Fatal.	Recoveries.
92° to 98°	104	139	100° and below	32	142
98° to 99°	80	145	100° to 101°	23	121
99° to 100°	76	95	101° to 102°	12	61
100° to 101°	21	38	102° to 103°	22	48
101° +	6	13	103° to 104°	44	28
102° —	6	2	104° to 105°	48	8
102° +	14	0	105° to 106°	51	0
			106° to 107°	36	0
			107° to 108°	32	0
			108° to 109°	9	0
			109° to 110°	4	0

It will be observed from this table that when the highest temperature did not go above 103° the number of recoveries was greatly and favorably disproportionate to the number of deaths, and it is also worthy of note that with a primary temperature above 102°, or a subsequent temperature above 105°, recovery never occurred.

According to the same author the loss of consciousness which immediately succeeds a cephalic injury is always the result of diffuse cerebral contusion, but if unconsciousness is preceded by an interval of consciousness, however brief it may be, or if after the restoration of consciousness unconsciousness soon supervenes, the latter is due to some form of intracranial hemorrhage. If after the lapse of some hours the patient still remains in an unconscious condition, and has a stationary temperature of only 1° or 2° above normal, it indicates hemorrhage of greater or less degree, but without any serious cerebral injury; a higher temperature and one rapidly rising, points to some cerebral lesion.

In every case in which there was a primary temperature of 102° or over, the pulse was at least 100, and usually much higher. Asymmetry of the pulse on the two sides was recognized in the fatal cases and those that recovered, but it was much more constant in the fatal cases (about 70 per cent.), and when found in cases which eventually recovered they were always of a grave type.

The respiratory rate was often accelerated at first and in fatal cases very rapid toward the end, with a subdural hemorrhage, in one or both posterior fossæ; the respirations are shallow and accompanied with cyanosis or pulmonary edema; sometimes sudden respiratory failure or a gradual retardation of the rate to two or three per minute was observed.

Treatment. During the continuance of shock Phelps is opposed to surgical interference except to control hemorrhage, but as soon as reaction is established a careful examination and, if necessary, a thorough exploration should be made. A fine, closed fissure with no intracranial complications may be disregarded, but an open fissure should be exposed by a rongeur, and under all circumstances depressed fractures should be elevated.

PERCUSSION IN FRACTURES. Pringle¹ has found percussion to be of considerable value in the diagnosis of cranial fractures. Percussion is best carried out by striking the scalp directly with the finger, while the occiput rests upon the hand. As the note is different when the mouth is opened or closed, the examiner should take care that it is either open or closed throughout the examination. The note over corresponding points on the right and left side of the skull should be compared. When a fracture exists in the neighborhood of any of the areas compared, the note will be found to be either (1) lowered in pitch over the fracture zone, or (2) in addition to the lower pitch, a cracked pot quality is introduced. These changes arise especially when there is a communication, or when the fracture is T-, L-, or V-shaped.

Abscess and Meningitis. The most common seat of abscesses of otitic origin, as is well known, is either in the temporosphenoidal lobe or in the cerebellum. In perhaps the majority of cases the localization of these abscesses is a matter of considerable difficulty, because they are so often subcortical. Any localizing sign, therefore, is welcomed, and according to Sachs and Berg,² sensory aphasia is perhaps the most constant in abscesses of the temporosphenoidal region. Involvement of the motor tract, as observed in their case, is quite rare. As for the technique, three points are emphasized: A liberal exposure of the suspected area; for this reason an osteoplastic flap is preferable to the older method of simply removing a button of bone and enlarging

¹ Edinburgh Medical Journal, June, 1909.

² New York Medical and Surgical Journal, January 23, 1909.

the opening with rongeur forceps. The latter predisposes to the development of a hernia cerebri. Provision for the adequate protection of the meninges must always be made. If the abscess be near the surface, the meninges may already be protected by previously forward adhesions, but in the absence of such protection, as in deep-seated abscesses, a two stage operation may be advisable. The third factor upon which stress is laid is adequate drainage. It must be remembered that there are two kinds of abscess cavities in the brain, one with soft walls which collapse readily after evacuation, and the other with rigid walls which must be obliterated gradually by the formation of granulation tissue. In the first type rubber tissue introduced at the most dependent portion of the abscess cavity is an excellent drainage material, and at the end of forty-eight hours may be removed. The opening in the scalp and skull, however, should be kept patulous by a small piece of gauze to carry off any retained secretion. In the second type drainage should be maintained by means of a tube inserted at the lowest point of the cavity.

Perhaps it may be interesting to be able to inspect the interior of an abscess cavity in the brain, but I can see no real value in the use of the encephaloscope, as commended by Whiting.¹ Nor can I approve of his recommendation to curette the wall of the cavity, however delicately; the danger of breaking down the only protection to the brain in this way is by no means imaginary. The most common cause of unfavorable results, and in this I quite agree with him, is because both during and after the operation the healthy brain tissue is not sufficiently well protected.

I must confess, though with reluctance, that no advance has been made in the treatment of meningitis. In fact, no contribution, especially noteworthy has appeared since the monograph of Ballance referred to last year. That meningitis serosa may not always be due to a hypersecretion of toxic origin, but, as Ballance suggests, to trauma, is well shown in Axhausen's² case. A child of eleven, was hit on the forehead by a stone, and shortly afterward the child developed symptoms of meningitis. Upon opening the dura, cerebrospinal fluid escaped as though under great tension, and the pia showed marked edema. After the operation both pulse and temperature returned immediately to normal, and for several days there was an unusually copious discharge of cerebrospinal fluid. The flow of cerebrospinal fluid was suddenly arrested, when the temperature rose again and the symptoms recurred. Upon reopening the wound and trephining farther back over the motor area, tension was relieved; the symptoms subsided and the child recovered. The fluid was sterile. In such cases it seems to me quite possible that with the subsiding inflammation a pocket of fluid could

¹ Medical Record, January 23, 1909.

² Berliner klin. Wochenschrift, February 8, 1909.

easily be walled off; this may be the origin of the recently described subdural cysts of the brain and spinal cord.

THE FACE.

Rhinoplasty. Koschier¹ describes two cases of nasal deformity operated upon by Foderl's method. This, it will be remembered consists in the introduction of a perforated celluloid plate, shaped like the new nose, between the skin and periosteum of the forehead. After healing in has resulted, the skin, plate, and periosteum are lifted and turned on a pedicle and the raw edges sutured to the freshened edges of the nose. The plate gives rigidity and prevents sinking in or spreading until bone has been proliferated from the periosteum. Koschier records photographs of one of his patients, and the result appears to be excellent.

Noma. Crandon, Place, and Brown² present a very complete report upon this interesting disease, and publish some good pictures. The report is based upon 46 cases of *gangrenous stomatitis* and 7 cases of definite gangrene of the lip or cheek, with recovery of 2 in the latter group. In all of the 7 cases of noma, smears from the surface and superior layers of the ulcerations showed the fusiform bacillus and spirocheta gracilis; in the early stages they were in practically pure culture. Three specimens were studied histologically and showed that "the lesion in noma is necrosis, due to a fusiform bacillus, which grows best along the edge of the necrotic tissue adjoining living tissue. The organism steadily invades and destroys the living tissue. In some cases it excites almost no inflammatory reaction. In other cases the reaction is considerable. In the necrotic tissue the fusiform bacilli rapidly die out and the tissue becomes invaded by various other bacteria." They remark that the differentiation between noma and *Vincent's angina* only can be made as the clinical process advances. The duration is from four to ten days, the mortality at least 70 per cent.

Treatment must be directed along the lines of hygiene, both general and oral. Peroxide of hydrogen should be useful, as the bacillus fusiformis is an anaërobe. In the ulcerative stage chromic acid in from 2 to 10 per cent. solution may be painted on the ulcers twice a day, following thorough applications of the hydrogen peroxide. The actual cautery or excision may be required after necrosis is well established.

They offer the following conclusions: "Noma is not proved to be a contagious disease, and need not be isolated. Any uncared-for mouth, particularly in a sick child, and especially after measles, may

¹ Wiener klin. Wochenschrift, December 10, 1908, p. 1734.

² Boston Medical and Surgical Journal, 1909, vol. clx, p. 473.

contain bacillus fusiformis and *Spirocheta gracilis*. In such a mouth these organisms may be found without ulceration or in the lesions which have been described as stomatitis gangrenosa, Vincent's angina, and noma. The lesions, in other words, may be only around the roots of teeth, or tonsils and pillars, on inner sides of cheek, in nasal fossæ, on the external ear, and about the genitals. Any of these conditions, including the extensive gangrene and sloughing of so-called noma may be different stages of the same disease, which may be, therefore, considered as not necessarily a specific disease, but the successful ingress of mouth bacteria into tissues rendered non-resistant by uncleanliness and preceding disease."

Noma becomes of added interest when found in the lower animals, and especially in a wild animal. White and Blackwood¹ report the findings in a case of gangrenous stomatitis occurring in a Rhesus macaque monkey. A purplish discoloration appeared in a small area upon the lower lip, which in twenty-four hours greatly increased in size, involving the entire lip, spreading to the gum and eroding the bone of the jaw. A fusiform bacillus and a spiral microörganism resembling Vincent's spirillum were found in the exudate and scrapings of the diseased area, and upon histological examination of the tissue, rod- and thread-like organisms were found similar to those described by Perthes, Brüning, and others.

Parotitis. In 1886 Paget drew attention to the occasional occurrence of parotitis secondary to abdominal lesions, and for a long time some mysterious association was thought to exist between ovarian disease and postoperative swelling of the parotid. At present it is generally agreed that infection, direct or by way of the bloodstream, is responsible for this condition. Rolleston and Oliver² call attention to secondary parotitis in the course of gastric ulcers treated medically by oral starvation. In the twenty-years—1889 to 1908—there were 1000 cases of gastric ulcer treated medically in St. George's Hospital, and of these, 23 developed parotitis. In 470 cases treated by rigid oral starvation the percentage of parotitis was 4.5 per cent., while in the 530 cases allowed something, even though only water, by mouth it was 0.4 per cent.; 4 of the 23 progressed to suppuration, with 2 deaths. They conclude that the dry condition of the mouth is responsible for the parotitis, and note that mouth washes do not prevent its occurrence.

Marchetti³ believes that postoperative parotitis is not scialogenic in origin, but is due to some unrecognizable trauma of the gland. He bases this opinion on the fact that the dryness of the mouth, the manipulations of the anesthetist, etc., are present in all operations, and yet

¹ University of Pennsylvania Medical Bulletin, December, 1908, p. 291.

² British Medical Journal, May 29, 1909, p. 1296.

³ Riforma Medica, January 25, 1909.

the condition is rare. He divides the lesion, clinically, into three groups: (1) A mild catarrhal type, usually of a week's duration and without suppuration (33 per cent.); (2) a severe, and often fatal type where extensive phlegmonous inflammation occurs, with necrosis, suppuration, and often destruction of the gland and the formation of a salivary fistula (48 per cent.); (3) a suppurative process, which discharges itself through Steno's duct (19 per cent.).

Salivary Fistula. Maclaure¹ discusses those fistulæ of Steno's duct originating from causes other than trauma. He has found a number of cases in the literature where dental caries has proceeded to abscess formation, and upon evacuation a salivary fistula has persisted. In some cases a sequestrum was removed from the salivary gland. He reports a case of tuberculous osteitis of the superior maxilla which caused a salivary fistula.

Mikulicz's Disease and allied conditions are well considered by Howard² in a lengthy and complete article. Although this affection was first described in 1888, Howard accepts but 55 cases, including 4 of his own as being true to the type; 20 others are classed as pseudoleukemia and 6 as true leukemia with coincident enlargement of the lacrymal and salivary glands. He does not believe that we are justified in considering Mikulicz's disease as a distinct clinical entity, but rather as a clinical syndrome which may or may not run its course without involvement of the lymphatic and hematopoietic systems. He believes that under this term we must accept isolated, as well as symmetrical, disease of the lacrymal and salivary glands due to simple lymphomata, pseudo-leukemia, leukemia, tuberculosis, and syphilis.

The three groups first mentioned may be distinguished as follows: (1) The simple form affects males more frequently than females, the age limit varying widely between twenty and sixty. The lacrymal glands are usually first affected, with lacrymation, ptosis, exophthalmos, and interference with vision. Later, the parotid, submaxillary, and sublingual glands become involved, and sometimes the glands of Blandin-Nuhn and Weber. In some cases one gland alone is involved. The tumors are firm, smooth, painless, free from tenderness, and not adherent. The lymph nodes and spleen are not affected. There is no fever nor malaise. The blood picture remains quite normal for years. The condition may yield to treatment, spontaneously subside, be influenced favorably by some intercurrent infection, or be cured by extirpation of the affected gland. (2) The pseudoleukemic group is marked by an associated local or general enlargement of the lymph nodes and sometimes by involvement of the spleen. There is a tendency to hyperplasia of the lymphadenoid tissue in the conjunctiva, orbits,

¹ *Archiv. Gén. de Chir.*, August 25, 1909.

² *International Clinics*, vol. i, nineteenth series, p. 30

and nasopharynx. The blood picture is that of anemia and a relative or absolute increase in the small lymphocytes. (3) The leukemic group presents the usual picture of lymphatic or perhaps also of myelogenous leukemia plus the symmetrical enlargement of the lacrymal and salivary glands. Howard inclines to a combination of lymphadenoid hyperplasia and inflammation in discussing the pathogenesis, and agrees with Mikulicz that the condition is a parasitic or infectious process, perhaps originating in the mucous membrane of the conjunctiva and then successively infecting the glands. As to treatment, arsenic, potassium iodide, and the x -rays are mentioned; extirpation may be resorted to for esthetic purposes, and operation may be entertained if there is a suspicion of lymphosarcoma.

Ziegler¹ also presents a complete report upon this disease, based upon two cases and a study of the literature. He gives a splendid bibliography. It will be noted that Howard does not consider this affection to be a clinical entity, but Ziegler does so in the following words: "Careful differentiation of the symptom complex described by Mikulicz demonstrates that this disease is a pathological entity, *sui generis*, and not associated with any systemic disease. The glandular enlargements of leukemia, pseudoleukemia, syphilis, lipoma, and carcinoma are so characteristic that they should easily be differentiated."

Ziegler discusses the use of arsenic, iodine, pilocarpine, thyroid extract, and the x -rays. He believes that "operative measures may be indicated in certain isolated cases. Extirpation of the enlarged glands has been practised by many, but not with any degree of success. Partial excision has been followed by renewed growth in the remaining portion, while total extirpation has been successful in preventing recurrence only because all glandular elements have been removed. The remaining glands have shown a more rapid growth on this account. We should bear in mind the important fact that the total destruction of these glandular functions may bring discomfort and possibly disaster to the patient. On the other hand, if the glands are so large that their encroachment is distinctly harmful, then they must be extirpated. This, however, should only be considered as a *dernier ressort*. The operation of extirpation, especially of the parotids, is a difficult one, and often attended with considerable danger." Ziegler emphasizes the necessity for correcting all obstructive respiratory lesions, and so, enlarged tonsils and adenoids should be promptly removed, swollen inferior turbinates should be reduced by linear cauterization, while obstruction of the upper air passage by a flabby or enlarged middle turbinate should call for its early excision.

Tumors of the Salivary Glands have usually appealed more to the pathologist than to the surgeon. Their etiology and pathology offer a

¹ New York Medical Journal, December 11, 1909, p. 1159.

very attractive field for investigation. Speese¹ describes several of the less common forms, and discusses briefly, but thoroughly, the modern views as to the origin and nature of the mixed tumors, with a report of the cases from my wards in the University Hospital. We have the records of eleven operations upon ten salivary tumors, nine of the parotid and two of the submaxillary, and although mixed tumors are by far the more common, almost one-half of our cases presented distinctly malignant lesions, three carcinomata, one sarcoma, and one angiosarcoma. Two cases were of interest because of the rarity of the lesion, one a mixed tumor of the submaxillary glands, the other an angiosarcoma. A third case was thought to be a pure myxoma, but after careful study Speese found cartilage and parenchyma cells, and classed it as a mixed tumor.

Speese inclines to the view of those who regard parenchymal cells as being of epithelial origin and the stroma as arising also from mesoblastic tissue displaced at an early time. The relatively low malignancy of these tumors is believed to be due to the slow cell division, the poor blood supply, and the lack of relation between the tumor cells and bloodvessels. When considering the propriety of operating on mixed tumors, surgeons should bear in mind these important facts:² (1) That 25 per cent. of mixed tumors undergo changes which express themselves in a clinically malignant course; (2) that 30 per cent. recur after removal, and, what is of equal, if not greater, importance, that in cases of recurrence after operation a previously benign tumor frequently undergoes rapid malignant metamorphosis.

The Jaws. DISCITIS MANDIBULARIS. Lanz³ describes two cases of this condition, and because of the abnormal laxity of the interarticular disk believes it to be analogous to the common dislocated semilunar cartilage of the knee. The patient suffers from pain, a feeling of abnormal laxity in the joint, and cracking sounds on motion. They were successfully treated by removal of the disk through a horizontal incision made over the lower margin of the zygoma.

GUNSHOT INJURIES OF THE LOWER JAW and their treatment are ably discussed by Dr. Hashimoto, one of the Surgeon-Generals of the Japanese army, and the treatment of 14 soldiers shot in the Japanese-Russian war is described. He offers the following conclusions: (1) Extraction of the comminuted fragments and smoothing the ends of the bone lessens suppuration, and the dislocation and deformity of the jaw can at the same time be diminished. (2) Functional disturbances of chewing, speaking, and nourishment are to be feared. (3) Deformity and dislocation depend upon the contractures of muscular and scar tissue; the direction depends upon the seat of fracture. (4)

¹ University of Pennsylvania Medical Bulletin, January, 1909, p. 329.

² Frazier, Pennsylvania Medical Journal, February, 1909, p. 355.

³ Zentralblatt f. Chirurgie, No. 9, 1909.

Recent injuries should be treated by proper bandaging; as they may result in a luxation which later is difficult or impossible to correct. (5) The prosthetic appliances must be suited to the comfort of the patient; absolute fixation is unnecessary and often impossible in a restless patient. (6) Fixation of the prosthesis in the medullary cavity is not only impracticable but also dangerous. (7) The application of the prosthesis directly after operation does not exactly correct any interference with "biting" power unless overcorrection is done. (8) If recurring dislocation occurs after the first prosthesis, a second attempt must be made to correct the same. (9) Between the fragments there forms a firm connective tissue which hinders dislocation and assists in the application of a set of false teeth. (10) The prosthesis proposed has many advantages. The mouth and speech functions readily accommodate themselves to the apparatus, the patient can chew solid food without injury, the tongue movements are free, there is no interference with swallowing, and ptialism and insomnia are rarely observed. The prosthesis used by Hashimoto consists of an aluminum plate, shaped to the curves of the jaw and screwed in place to either fragment, with, as has been said, overcorrection of any deformity. He uses Lisfranc's incision to approach the jaw. A second plate made of gutta percha caps the teeth on the affected side.

EXCISION AND RESECTION OF THE LOWER JAW are followed by greater mutilation and disfigurement than follow any other oral or facial surgery. Gilmer¹ makes an earnest protest against the common practice of removing portions of the jaw in suspected malignant disease. When the continuity of the jawbone is broken, facial deformity results, and no means of restoration by prosthesis or otherwise has as yet been suggested or employed which meets the demands either cosmetically or functionally in any degree satisfactorily. The muscular force necessary for mastication necessarily rotates the fragments, and in time all appliances will give way even in those more favorable cases, in which a section has been removed from the anterior part. The surgeon should therefore be slow in deciding on an operation so radical as exsection or resection. Gilmer furthermore believes that even in some types of malignant disease, unless the bone throughout its entire thickness is involved, it is good practice to do an operation which will save at least a small part of the body of the jaw in its continuity, taking some risk of recurrence rather than maiming the patient for life.

THE MOUTH.

Cancer of the Lip. Steiner² presents a study of the cases observed in the last ten years in Dollinger's clinic in Budapest. There were

¹ Journal of the American Medical Association, August 7, 1909, p. 444.

² Deutsche Zeit. f. Chirurgie, 1909. Band xevii, S. 243.

158 primary and 42 recurrent cases. Primary carcinoma occurred in the lower lip 140 times, of which, 128 (91.2 per cent.) were in men, and 12 times in the upper lip, of which, 9 (75 per cent.) were in the male sex. The left side of the lip was involved in 42 cases, the right in 40, the middle in 62, and in 14 the entire lip was affected; 82.9 per cent. of the cases occurred between the ages of forty-one to sixty-five. In only 55.6 per cent. of the cases was the patient seen within the first year of growth. The majority had tried the various salves, applications, and quack remedies day after day, until the disease was well disseminated and 125 of the 158 presented deep ulceration and 70 per cent. palpably enlarged lymph nodes when first seen.

Steiner notes the usual etiological factors as being present. The great majority of the patients (field workmen) were addicted to smoking; previous inflammatory lesions, warts, scars, psoriasis, etc., were also present in some cases. The technique of operation consisted in a dissection of the neck first, followed by the removal of the growth, except in those cases where there is evidence that the invasion of the neck is progressing, in which case the primary growth is first removed. There were no deaths from the operation itself. Ninety cases were operated upon in the first seven years, and 72 of these were traced, of which, 46 (62 per cent.) were found to be free from recurrence at periods varying from four to ten years, 35 of them having lived beyond the five-year limit. Of 23 recurrent cases, 22 patients died and 1 is living after a secondary operation. The interesting fact is recorded that no conclusions can be drawn based upon the relation of the duration of the growth to the prognosis, as 71.7 per cent. of the "cures" were operated on within the first year, while 84 per cent. of the recurring cases were also operated on in that period. Recurrent carcinoma of the lip was observed 42 times in all, but as 14 of these were operated upon in the last three years they were omitted. Of the remaining 28, the recurrence was purely local in 6. These patients were submitted to 78 operations altogether, and when subsequently traced only 4 were found to be free from recurrence, the remainder, 21 in number, having died usually within the first year.

Hertzler¹ urges the importance of more thorough removal of lip cancer. He emphasizes the gland-bearing area, the submental and the infra-maxillary in the first link, the subhyoid and the submaxillary in the second link, and the deep cervical in the third, and believes that the first and second links should be removed in all instances, and if obviously cancerous the third link, the deep cervical glands on the corresponding side, or on both sides, as the case may be, should be removed. A small area of skin is allowed to remain attached on the chin, as it enables the flap to be kept in position, and as the lymphatics pass on either side

¹ Surgery, Gynecology, and Obstetrics, July, 1909, p. 80.

there is no reason for its removal. In closing the incision in the lip, Hertzler describes a special suture, in which the knots are all placed on the skin surface, and yet the vermilion border is held in apposition.

Carcinoma of the Tongue. The contributions of Henry T. Butlin, F.R.C.S., upon this subject have enriched the literature for many years, and it is but fitting that more than passing mention should be given his latest contribution,¹ although it is one difficult to present in abstract. He records an analysis of 197 cases operated upon between the years 1881 and 1908, and in a second paper² remarks that the number had reached 200. In the later paper he states "that about 820 people suffer from cancer of the tongue in England every year, and that about 750 of them die of the disease, either with or without operation." He reproaches American and Continental surgeons for their pessimistic views upon the outcome of operation for cancer of the tongue.

The most frequent and most typical conditions in which cancer begins are grouped as follows: "(1) A little plaque like a hard sore, smooth and polished, but neither ulcerated nor excoriated. (2) The transformation or replacement of a simple ulcer by a cancerous ulcer, which only differs from the simple ulcer by feeling a very little stiffer and a very little firmer. (3) The transformation of an entire plaque of leucoplakia into a plaque of cancer. The difference is marked by very slight thickening, a dense white, and furrowing or fissuring in various directions, but without excoriation or ulceration. (4) The transformation of one small area of a leucoplakic tongue into cancer, only marked at first by very slight and superficial hardening. (5) A white warty growth or compound wart, neither broken nor ulcerated, and feeling at first as if it were fixed to the mucous membrane and quite superficial." Of the 197 cases, 20 died as the result of operation, (10 per cent.); 86 died of recurrence in the tongue or glands, or both (43 per cent.); 55 lived for from three to twenty-two years free from recurrence (27.5 per cent.); and 22 could not be counted within the three-year limit (11 per cent.); a few others died of metastasis to the lungs, were not completely operated on, etc. One-half of the deaths were due to septic pneumonia, the remainder from hemorrhage, shock, sepsis, heart failure, etc. When the number of cases was divided in half it was seen that while the mortality was nearly the same, there were 23 successes in the early series and 32 in the later.

Butlin then shows in two very interesting tables that the percentage of successful cases where the glands were *not* removed was 29.26, while those in which the contents of the anterior triangle *were* removed, the percentage of successes was 42.01. He believes that the evidence of his results is largely in favor of not deferring the operation on the

¹ British Medical Journal, January 2, 1909, p. 1.

² Ibid., February 20, 1909, p. 462.

glands until they are enlarged, that both the anterior and posterior triangles should be dissected out, that it is not necessary to remove the glands on both sides of the neck in every instance, nor is it always necessary to remove the muscles to their attachments or the tissues between the primary disease and the glands.

The following conditions, however, would call for wider removal of the glands: "(1) Those cases in which the glands on both sides of the neck were enlarged. (2) Those cases in which the glands are affected only on the side of the neck opposite to the disease. (3) Those cases in which the disease is seated on both sides of the tongue, or in which it reaches to the middle line of the tongue. (4) Those cases in which microscopic examination reveals the extension of cancer cells deep down between the muscular fibers, even though the primary focus seems small in extent." In the more advanced cases he agrees with Cheate, whose articles I reviewed last year, that the muscles, especially the hyoglossus, geniohyoglossi, and inferior lingualis should be removed. The interesting fact is also recorded that "out of a large number of the unsuccessful cases, in which recurrence took place either in the mouth alone or in the mouth and neck, and in which the seat of the recurrence was noted, there were only two in which it could reasonably have been attributed to affection of the tissues which were left behind between the primary disease and the glands."

Last year I reviewed the report of J. Collins Warren on the results of operation for cancer of the tongue, mouth, and jaw, at the Massachusetts General Hospital, from 1890 to 1904. Greenough, Simmons, and Green¹ have since published the same statistical study in more extended form, and from this report I have taken the following: They lay emphasis upon the fallacy of estimating the duration of growth and using this as an argument for earlier operation, a more reliable method being the estimation of the local extent of the disease. Fifty-eight traced cases of cancer of the tongue and floor of the mouth which were submitted to operation were divided into three classes, as follows: (a) Tongue alone involved: 24 cases; 8 successful, 33 $\frac{1}{3}$ per cent. cured. (b) Floor alone involved: 4 cases; 1 successful, 25 per cent. cured. (c) Surrounding tissues, jaw, cheek, palate, etc., involved: 29 cases; 1 successful, 3.4 per cent. cured. This gives a striking proof of the importance of the local extent of the disease in establishing the prognosis for cure by radical operation.

Four types of operation were distinguished: (1) Intrabuccal, 20 cases; 8 cures (40 per cent.); operative mortality, 5 per cent. (2) Kocher's, 29 cases; 2 cures (6.9 per cent.); operative mortality, 10.3 per cent. (3) Von Langenbeck's, 4 cases; no cures (0.0 per cent.); operative mortality, 25 per cent. (4) Symes, 9 cases; no cures (0.0

¹ Boston Medical and Surgical Journal, May 6, 1909.

per cent.); operative morality, $33\frac{1}{3}$ per cent. They remark, however, that the early and more favorable cases were considered to be suitable for intrabuccal operation, and this opinion seems to be substantiated by the results. Twenty-eight cases of cancer of the lower jaw were operated upon, with an operative mortality of 25.5 per cent., 5 cures and 11 recurrences. Twelve resections gave 1 cure and 4 operative deaths; 4 with dissection of the neck gave 1 cure and 2 operative deaths; 3 resections of the jaw and other parts of the mouth, with neck dissection, gave 1 cure and 1 operative death; 7 minor operations gave 2 cures and 2 operative deaths. Of the 7 cases in which a neck dissection was performed in addition to the primary operation, 3 died of operation, 2 had local recurrence, and 2 were apparent cures. Ten cases of cancer of the upper jaw were operated upon, none dying of operation, but 9 had return of the disease, and the result in the other case is not known. Four cases of cancer of the tonsil, fauces, and soft palate were operated upon, with 1 cure, the others dying five, eight, and twenty months respectively, after operation. The cured case involved the soft palate only. Eight cases were operated on for cancer of the cheek. None were cured, and no case lived over two years after operation. The operative mortality was 75 per cent. The writers refer in this paper to the duration of life enjoyed by those operated upon and those not operated upon. Placing them in tabular form:

	With operation. Months.	Without operation. Months.
Tongue and mouth	16.9	16.4
Lower jaw	10.9	5.4
Upper jaw	—	6.5
Tonsil	11.4	6.4
Cheek	8.6	7.0

Childe¹ discusses the operative treatment of intra-oral cancer based upon an experience of 39 cases. His conclusions are worth reproducing in abstract: (1) The neck should always be attacked first, with ligature of the lingual and facial arteries on one or both sides. This maneuver permits a bloodless operation, enables the primary growth to be removed with greater precision, and does away with the necessity for preliminary laryngotomy or tracheotomy. It cuts off the blood supply to the tumor if the operation is to be done in two stages, and will possibly starve any cancer cells which may be left behind. He believes that it is the key to the operation. (2) A communication between the mouth and the neck should always be avoided when possible. Unless the growth is situated in the neighborhood of the tonsil or the patient insists on a single operation, this can always be avoided by dividing the operation into two stages in those cases where it is necessary to

¹ British Medical Journal, January 2, 1909, p. 6.

divide the jaw. The neck should always be attacked first. He emphasizes the importance of early diagnosis and the use of the microscope as the only test, and would relegate potassium iodide to "the limbo of dangerous playthings."

Don¹ emphasizes the necessity of careful pre-operative treatment. Carious teeth should be removed, mouth washes of formalin or carbolic acid should be used, and the food must be sterilized and liquid. The gums from which teeth have been removed must be allowed to heal before the operation, and Don also recommends that the tumor, or ulcer on the tongue, should be widely excised and the edges of the wound brought together or cauterized. All of these precautions are necessary to avoid sepsis and aspiration pneumonia. If the operation is done in two stages, Don does not agree with Poirier and Childe that the glands should be removed first, as the infection will, in the interval between the two operations, be carried by other lymph channels to other glands on the same or opposite sides. The vascular sheath should not be opened up at the first operation. The lingual arteries are ligated at the point of election. Temporary section of the jaw is not necessary, it being better to split the cheeks to the masseters if more room is required. The removal of the glands should be undertaken as soon after the primary operation as possible, but not until the patient has fully recovered and is taking nourishment by the mouth, freely and painlessly, and the mouth is quite shut off from the neck.

Don describes a one-stage operation which he considers ideal if the patient's condition permits carrying it out. "Two incisions are carried from the lower jaw just in front of the crossing of the facial vessels, one backward in the direction of the margin of the jaw, till well past the anterior border of the sternomastoid, and a second down to behind the sternoclavicular joint. The skin and platysma are first reflected back onto the muscle, which is cleaned and retracted, and the sheath of the vessels opened in its whole length. All glands and tissues are dissected forward and upward, leaving the vessels quite clean, and even removing, if necessary, the whole of them and the vagus nerve. The glands above the bifurcation of the carotid, and up to well above the digastric muscle, and below the level of the omohyoid below must be, in all cases, cleanly lifted up *en masse*. Ascending to the position of the original cancer focus, will now depend the extent of the blood supply to be cut off, but the external carotid itself may be ligatured close to its origin, if desirable, or a temporary clamp may be placed on the common trunk.

"In all cases the lingual and facial must be secured. This should be done with silk. The incision has now to be carried forward under the margin of the jaw, while the dissection is continued

¹ Practitioner, April, 1909, p. 468.

below. The posterior belly of the digastric and the stylohyoid and the hypoglossal nerve will have already been cut. The posterior flap, when its bed is quite cleared, is at once sutured closely down over the vessels and above the hyoid, so as to entirely close off the vessels in the part behind. The surgeon then works from inside the mouth. The mucous membrane is reflected close to the lower jaw and the soft parts pushed toward the tongue, the geniohyoglossi being cut through at their attachment to the jaw. After this stage it becomes necessary to carry farther forward the dissection of the second flap under the chin, but the skin should be left attached to the underlying tissues as long as possible to preserve its vitality. The gradual freeing of these tissues below allows of the easy retraction upward of the lower jaw and head, so that the field of operation becomes quite superficial. Hemorrhage which till now has been comparatively little, will begin to be rather free after the middle line is crossed, and it is better to clear the tongue from the tip, taking with us the probably infected submental tissues. The tongue is pulled outward, and the sublingual salivary glands on the opposite side are brought into view. This part is done by blunt dissection with the scissors, the tougher fibrous strands being doubly ligatured and cut, as hemorrhage here is difficult to stop when once the tissues retract. As one works round at the side and below, the lingual artery and other vessels of the opposite side can be seen and secured before being cut, and the submaxillary gland is then reached. The facial artery should be spared on this side if possible, though a branch of it is usually encountered and ligatured. The tongue is now almost free, and, as both linguals have been secured, it can be cut across back to the epiglottis and the whole removed in one piece. The anterior skin flap is finally dissected off the mass."

"The mucous membrane is brought together as well as possible inside the mouth, and a lateral funnel of skin below the jaw is sutured to the mucosa internally. The vessels have been covered early before opening the mouth, and this was done by passing an end of the skin under the jaw and suturing it to the constrictor and thyroid muscles. The rest of the skin wound is sutured up." No dressing is put over the wound. Don lays special emphasis upon the postoperative treatment; the patient should be turned on the affected side and partly onto the face till completely conscious, and this, or the lowered head position, must be kept up till the healing has fairly progressed and risk of infection of the neck is past. In the two-stage operation the patient assumes the sitting position as soon as possible.

Ehrlich¹ reviews the cases observed in the clinic and private practice of v. Eiselsberg from 1901 to 1906, 64 in number. Curiously, in only 1 case was the female sex affected. In 21 cases the tongue alone was

¹ *Archiv f. klin. Chir.*, Band lxxxviii, S. 427.

involved, and in 15 the tongue and mouth immediately adjacent were affected. In 70 per cent. the lymph nodes were palpably enlarged. Fifty-one of the patients were submitted to operation, and of these, 13 died (25 per cent.), 8 suffered a recurrence, and 5 were considered as cured at the end of three years. Of the 13 deaths, 8 were due to lobar pneumonia or gangrene of the lung, 2 from secondary hemorrhage, 1 from infection, 1 from apoplexy, and 1 from the rupture of a tuberculous cavity into the pleura. The duration of life in those operated upon and dying averaged 4.6 months longer than those not operated.

As a result of his statistical study, Ehrlich summarizes as follows: (1) In spite of the high mortality of operation (25 per cent.) and the small number of cured patients (13 per cent.), cancer of the tongue should always be submitted to operation, as even in those cases which are not cured the time of life will be lengthened. (2) In operating upon the early cases the deep nodes of the neck should be removed as well as the submaxillary group. (3) Extirpation of the primary tumor without dissection of the nodes is in the great majority of cases to be condemned. (4) Temporary section of the inferior maxilla gives the best exposure of the field of operation. (5) Lobar pneumonia as a result of expiration and of prolonged dorsal decubitus should be carefully guarded against. (6) In luetic persons, potassium iodide should be administered.

Steiner¹ analyzes the cases of cancer in the mouth cavity in Dollinger's clinic in Budapest. The following table illustrates graphically the results:

	Cheek,	Alveolus,	Palate and tonsils,	Tongue.	Total.	Per cent.
Total cases	61	13	7	51	132	
Cases traced	26	6	4	22	58	
Operative deaths	3	1	1	9	14	24.1
Intercurrent deaths	1	—	—	—	1	1.8
Recurrence within three years . .	18	4	2	13	37	63.8
Free from recurrence after three years	4	1	1	—	6	10.3

Interesting as these statistics are, they do not offer us a true estimate of the state of affairs, as only 44 per cent. of the total cases were traced. I have always held the opinion that 90 per cent. of the total cases should be traced before reliable statistics can be made. Steiner finds that congenital anomalies, scars, psoriasis, and leucoplakia frequently precede the cancer, and that the excessive use of tobacco is a distinct predisposing cause. The metastasis almost invariably occurs in the regional lymph nodes, distant metastasis being uncommon. The majority of the deaths occurred from pneumonia. In the cheek group he believes that a good result can always be looked forward to if the

¹ Deutsche Zeit. f. Chir., January, 1909, S. 1.

cancer is confined strictly to the mucous membrane of the cheek and the operative incision is carried well away from the growth. In 24.4 per cent. of his cases a bone operation was necessary. In cancer of the tongue the technique varied. Whitehead's, Sedillot's, and Langenbeck's methods, cheek splitting, lateral and suprahyoid pharyngotomy were all practised. He objects to nasal feeding, as liable to produce nasal suppuration.

Malignant Disease of the Tonsils. George B. Wood¹ reports 2 cases, and has gone over the literature since 1884, collecting 137 cases, which have been reported in sufficient detail to enable them to be used for statistical purposes. There were 69 cases of sarcoma, 64 cases of carcinoma, and 1 case of endothelioma. In the carcinoma group there were 42 males and 6 females; the average age was 55.9 years, the youngest patient being twenty-nine, the oldest eighty-two; carcinoma is apt to involve the surrounding structures. In the sarcoma group there were 34 males and 22 females; the average age was 48.7, the youngest patient being six, the oldest eighty-nine. Sarcoma has a tendency to remain limited to the capsule of the tonsil, and only when it breaks through does it involve the pillars of the fauces and other surrounding structures. He notes the peculiar fact that it shows a very strong tendency to give metastasis to the lymph nodes, equalling in this aspect the lymphatic metastasis of carcinoma. Treatment is purely surgical, and the growth may be removed either through the mouth or by an external operation, the latter giving much the greater mortality, but probably the best ultimate results. The method of operating depends to some extent upon the nature of the tumor, sarcoma being more often accessible through the mouth, cancer rarely so. In every case the external carotid should be ligated and the lymph nodes dissected out. The methods of Langenbeck, v. Mikulicz, or Warren may be practised.

Cleft Palate. In the last few years I have had occasion to point out the increasing tendency to operate upon this deformity at a very early age. Garretson, Brophy, Lane, and others have for some time been earnest advocates of the early operation. Eastman² formulates this position as follows: "(1) The baby weighs more just after birth. (2) Resisting power has not been reduced by the breathing in of cold air through a roofless mouth. (3) Digestion has not been impaired by unsatisfactory feeding. (4) The bones are softer. (5) The impression of pain is not so acute. (6) The child has not developed the habit of articulating through the cavern of the nose. (7) By immediate operation the muscles of the palate are given an opportunity to develop instead of atrophy, and there is afforded the greatest possi-

¹ Pennsylvania Medical Journal, March, 1909.

² Annals of Surgery, January, 1909, p. 34.

bility of development of the nasopharynx as the result of the pressure exerted by the air as it passes through. (8) After early operations the nose is gradually pushed forward by the growth of the septum."

Eastman's article is very complete, well illustrated, and consists of a running commentary upon the writings of those who advocate the early operation. From it I glean the following: Various observations upon man and the lower animals show that the infant has a tolerance for traumatism which becomes less in evidence as the infant grows older. If the cleft be closed during the first week, the nasopharynx is systematically and forcibly dilated and ventilated. The harelip should be closed at the same time, as the soft parts removed may be used in completing the anterior cleft of the palate, and the pressure of the complete lip tends to restore the premaxilla to its normal relationship. In operating, the child's head should hang down over the end of the table on to the operator's knee; in complete clefts the Lane gag is the best, but in the incomplete form the Whitehead gag meets every requirement. In denuding the margins of the cleft, the strip of mucous membrane should be removed, if possible, from the entire edge in one piece in order that the denudation may be complete all around; more membrane should be cut from the nasal than from the oral side of the palate. The mucoperiosteum is then separated by Brophy's periosteal elevators. "Simple mattressing of the bevelled edges of the freely loosened flaps in high palatal arches, and in lower arches the addition of relaxing incisions packed with sterile gauze to splint the flaps, the sutures being of chromic catgut," is the technique recommended by Eastman. He makes a point of definitely breaking up the attachment of the soft tissues to the sharp posterior edge of the hard palate and, if necessary, cutting through the mucosa upon the nasal side. The lateral incisions should only be made where necessary, a gradual cut and fit plan being followed, and division of the hamular process is never necessary.

After cleft palate operations the patient should receive rectal enemata during the first two days; if much blood has been lost, normal saline should be given by the bowel. After the second day, sterile milk and sterile water are given. If the infant is so weak that it cannot get on with rectal feeding for two or three days, the operation had best be postponed.

Compression in the treatment of cleft palate, as done with the Hoey clamp, by Brophy's method, etc., has been criticised by G. V. I. Brown.¹ "When the method is followed of treating infants with harelip and cleft palate in early infancy by forcing the sides of the fissure together and the use of wires placed through the jaws with lead plates to hold them in position, the result must inevitably be deformity through narrow-

¹ Journal of the American Medical Association, March 27, 1909, p. 1026.

ing of the nares, fixation of the maxillary bones in malposition, destruction of erupting teeth through their failure to erupt, arrested or imperfect development of the mouth, nose, and lower part of the face."

Ranzi¹ records the results of 61 operations for cleft palate, most of which were done either by the Lane or the Langenbeck-Billroth methods. There were 10 deaths in all, a mortality of 15 per cent. All of the deaths occurred in those of two years of age or under; 31.5 per cent. of those under two years of age were cured, while of those operated on after the second year, 71.4 per cent. were cured. Ranzi therefore believes that rhinoplasty should be done soon after the second year. He prefers the Lane method in wide clefts and the Langenbeck procedure in small clefts, especially when the sutures are applied by Bunge's method.

Helbing² reviews his experience in 53 cases of cleft palate with success in 75 per cent. He operates in two sittings and at a very early age, as he obtained better results and found the operation no more difficult in children under three months.

THE NECK.

Cancer of the Larynx. The treatment of this dread disease is essentially operative, as no authentic case has ever been cured by any other method. The mortality of operation is gradually being reduced, due to a more favorable selection of cases and better operative methods. This year I can present in abstract several important papers, those of Bell,³ Brewer,⁴ Greene,⁵ Chiari,⁶ and Koschier.⁷

Four methods of radical surgical treatment have been proposed (1) Intralaryngeal removal; (2) thyrotomy or laryngotomy, with removal of the cancer and subsequent closure of the larynx; (3) partial laryngectomy; and (4) total laryngectomy. The first of these operations has generally been abandoned, for, as Brewer states, "the gross uncertainties of such a procedure and the almost uniformly disastrous results which have followed the method have led to its general condemnation and abandonment." Chiari believes "that it may be indicated in small, circumscribed tumors with perfectly movable vocal cords." The advantage of the method lies in its absence of mortality. Thyrotomy or laryngotomy is the operation of choice in "all intrinsic cases of cancer, not too extensive, not too near the posterior wall, and

¹ Archiv f. klin. Med., Band lxxix, S. 609.

² Berliner klin. Wochenschrift, September 27, 1909.

³ Annals of Surgery, July, 1909, p. 92.

⁴ Ibid., November, 1909, p. 820.

⁵ Boston Medical and Surgical Journal, January 28, 1909, p. 99.

⁶ Wiener med. Wochenschrift, June 26, 1909, p. 1481.

⁷ Wiener klin. Wochenschrift, July 8, 1909.

not infiltrating the cartilages" (Semon). Brewer has performed 16 of these operations, with 1 death, but only 7 were cases of undoubted carcinoma. Chiari has performed 41 thyreotomies, with an operative mortality of 7.32 per cent., and a real, or apparent, cure in 36.75 per cent.; 29 per cent. of the cases were done too recently to draw deductions from, and 11 patients (27 per cent.) suffered a recurrence.

Brewer's technique is as follows: "A median incision is made from the upper border of the thyroid to a point just above the suprasternal notch. The lower part of this is deepened and the trachea exposed. When all bleeding has been arrested, the trachea is opened and a sponge plug or tampon, to which has been tied a double loop of strong silk, placed in the upper segment of the air tube, the distal end of the silk loop clamped with an artery forceps, and the cannula introduced. From this time the anesthetic is administered through the tracheal cannula. The upper part of the incision is next carried down to the cartilage, the thyrohyoid membrane is incised, and the thyroid, cricothyroid membrane, and occasionally the cricoid cartilage, divided in the median line, freely exposing the laryngeal cavity. The two halves of the larynx are next widely retracted and the mucous membrane swabbed with a 4 per cent. solution of cocaine and adrenalin. If any doubt exists regarding the competence of the sponge tampon, it is reinforced by gauze packing from above, to prevent the possibility of blood entering the trachea. The growth is now examined and its extent appreciated. If the case is a suitable one for removal by this method, the tumor, together with a generous margin of healthy tissue, is removed down to the cartilage. Bleeding points are controlled by clamps and fine catgut, by the use of peroxide of hydrogen, or the small cautery point. The cannula is removed on the day following the operation."

Greene emphasizes the value of swabbing the interior of the larynx with cocaine before removing the growth, in order to prevent stimulation of the inhibitory fibers of the pneumogastric. Partial or hemilaryngectomy is indicated, according to Brewer, in cases of unilateral intrinsic disease in which the lesion extends too far backward to promise a favorable result by simple thyrotomy, or when there is reason to believe that the perichondrium or cartilage is involved. The mortality is less than that of total laryngectomy. Chiari's experience embraces 32 operations, with 8 deaths, 15 recurrences, and 9 real or apparent cures. Total laryngectomy formerly gave a high mortality, but as a result of improvements in the technique the death rate has been greatly reduced. In 1908 Gluck reported 128 operations performed by himself, and stated that he had no operative deaths for the past four years in uncomplicated cases of total laryngectomy. Brewer's experience is limited to 11 cases with 5 deaths, Bell's to 12 cases with 5 deaths, and Chiari has performed 3 with 1 death.

In the discussion upon Bell's paper, Crile¹ reported 20 total laryngectomies, the first 8 performed without fixing the trachea, the last 12 along the lines described by Brewer. There were 2 deaths in the first 8 and none in the last 12. Brewer's technique may be abbreviated as follows: Under general anesthesia a median incision is made extending from the cricoid to the sternal notch. The isthmus of the thyroid is doubly ligated and divided, a low tracheotomy performed, and the peritracheal space packed with iodoform gauze. The patient is kept under a tracheotomy tent for ten days, and then, if the temperature is normal and there is no cough or excessive tracheal secretion, the secondary operation is undertaken. Chloroform is administered through the tracheal tube, and is preceded by scopolamine, $\frac{1}{100}$ gr., and morphine, $\frac{1}{6}$ gr., one-half hour before operation. An incision is made from the body of the hyoid downward to the upper limit of the former cut, and from the upper extremity of this incision two lateral incisions are made in an upward and outward direction, extending to the anterior border of the sternomastoid muscles. These muscles are divided, the sternothyroids detached, the superior thyroid arteries ligated, the superior laryngeal nerves cut, and all lymph nodes and neighboring lymph-bearing areolar tissues are removed. The larynx is then thoroughly skeletonized, the trachea is severed below the cricoid, and its distal extremity immediately packed tightly with gauze, completely preventing the entrance of blood or pharyngeal mucus. The larynx is then completely separated from the esophagus, the tips of the thyroid cartilage are divided, the thyrohyoid membrane incised, and the larynx removed. The pharyngeal opening is then closed, the tracheal stump removed above the cannula opening, and iodoform gauze packed above the tube. A No. 30 F. rubber feeding tube is then introduced through the left nostril into the esophagus, and secured by a safety pin and plaster straps to the face. The wounds are next united above. Brewer feeds his patients through the tube for at least seven days. Greene prefers rectal feeding, while Bell seems to prefer feeding through a tube introduced into the esophagus from the incision in the neck. Bell does not perform preliminary tracheotomy.

Cervical Dislocation. Sherman² reports 2 curious and interesting cases where subluxations of the neck occurred during sleep from a sudden twisting movement. He has observed 5 in all, and offers these conclusions: "Many cases, perhaps all cases, of suddenly acquired stiff neck, with distortion, or abnormal position of the head, which position the patient is unable to correct because of the pain produced, are cases of more or less pronounced dislocation of the articular processes of the vertebræ. In the great majority of these cases the articulating

¹ *Annals of Surgery*, July, 1909, p. 347.

² *Journal of the American Medical Association*, June 5, 1909, p. 1833.

surfaces are but slightly displaced, so slightly that many of the dislocations have been self-reduced during sleep or during the relaxation of anesthesia. These cases may occur during sleep or from direct trauma, as in football, and particularly from sudden turning of the head, especially if the muscles of one side are tense, as when carrying a heavy weight in one hand. Treatment by laterodorsal extension and rotation is very satisfactory, and the extreme cases are probably as amenable as the lighter ones to this treatment."

Tuberculosis of the Cervical Lymph Nodes. This common affection received but little attention during the year, the most complete article being one by Most,¹ of Breslau, who writes a long and scholarly review of the subject and includes a most complete bibliography. His paper is too long and too general in scope to present in abstract. He makes the interesting observations that, contrary to current opinion, the teeth, throat, and nose are rarely the portals of entry for the infection; patches of eczema, cracks, sores, etc., especially those near the junction of the mucosa with the skin being a much more important source.

This statement does not agree with the experience of Dowd,² who found that 81 per cent. of his cases showed the first noticeable infection in the subparotid nodes, indicating infection from the pharynx, tonsils, or posterior part of the mouth, and in most of the remaining cases the submental or submaxillary nodes were the first ones involved, indicating infection from the teeth, front part of the mouth, or face." Dowd also records the interesting fact that of 29 cases examined bacteriologically, in 9 (31 per cent.) the bovine type of tuberculosis was found. Clinically, this type of inflammation could not be distinguished from the human type. Duval³ describes in detail the cultural and other characteristics of 4 cases of bovine tuberculous adenitis.

TUBERCULIN THERAPY. In an oration delivered before the Pennsylvania State Medical Society in 1906 I discussed the effects of hygiene, passive hyperemia, opsonotherapy, and the x-rays upon lymph node tuberculosis, and published⁴ the opinions of Dr. B. A. Thomas and Dr. Pancoast upon the last two mentioned forms of treatment. Dr. Thomas made the following statement: "I am inclined to believe that there lies a fruitful field for tuberculin therapy, provided it is properly administered and the cases properly selected. In the first place, it is useless to resort to tuberculin therapy when there are tuberculous hypertrophied tonsils and adenoids, and in the second place this treatment should not be resorted to when there is extensive pulmonary disease. The best results are obtained in the incipient cases. When there is evidence of advanced caseation and liquefactive necrosis,

¹ *Deutsche Zeit. f. Chir.*, Band xevii, S. 294.

² *Surgery, Gynecology, and Obstetrics*, March, 1909, p. 232.

³ *Journal of Experimental Medicine*, May, 1909.

⁴ *Pennsylvania Medical Journal*, February, 1909, p. 351.

tuberculin therapy is unquestionably contra-indicated. As to the usefulness of this treatment as a prophylactic after operation, my cases have not been under observation long enough to enable me to draw any conclusions. With tuberculin therapy, more so with this than any other form of opsonotherapy, the doses at first should be very small, and the dose should be increased very slowly. These restrictions are of the utmost importance. The duration of the treatment is not less than six months, and often eight months or a year. Although it may be desirable to take the opsonic index from time to time, I believe the spacing and size of the inoculations can be regulated largely, if not exclusively, by close observance of the clinical phenomena."

X-RAYS IN TUBERCULOSIS OF THE LYMPH NODES. While my experience has been limited, it has left me with the impression that the *x*-rays will reduce the size of the swelling up to a certain point, and that there is always a residual mass which persists despite the continuation of treatment. I am very much more enthusiastic about the use of the *x*-rays as a prophylactic against recurrence after operation, or as favoring resolution in cases in which the periglandular tissues are already involved in the tuberculous process and, even though the glands may be removed, sinuses persist. When feasible, I refer all my cases to the *x*-ray laboratory after the operation, where, for a period of several months at not too frequent intervals, a short exposure is made.

Dr. Pancoast, whose experience in the *x*-ray laboratory of the University Hospital has been exceptionally large, writes me as follows: "Clinical results have by this time demonstrated that the *x*-rays deserve recognition as a valuable and efficient adjunct to surgery in the treatment of tuberculous adenitis. In considering the use of the *x*-rays, certain fundamental facts concerning their therapeutic action upon the tuberculous lesions should be carefully borne in mind: (1) *X*-rays have no direct bactericidal action upon the tubercle bacilli, hence their therapeutic action in connection with tuberculous lesions cannot be regarded as specific. (2) Their probable action, in the light of our present knowledge, is an indirect one and similar to that of all successful local measures employed in the healing of such lesions except rest; namely, a stimulative effect upon the surrounding healthy tissue cells and an increase in their nutrition, whereby they are enabled to render inactive or actually to destroy the active pathological factors in the lesion. In order to accomplish such a result, the *x*-ray applications must be administered with the judgment, care, and system derived from experience. Careless and unsystematic treatment not based upon experience is unscientific, and accomplishes little good. (3) The only direct destructive action lies in the probable capacity of the rays to hasten the destruction of cells of lowered vitality. This fact should be borne in mind because of the possible tendency of the applications to hasten the suppurative process in large glands in which caseation

has started or is about to begin. Our experience frequently indicates that this action does take place. (4) X-ray treatment cannot directly supplant surgery in any instance in which surgical measures are indicated, but there is ample clinical evidence of its value as an efficient adjunct to the latter by often simplifying serious and tedious operations, preventing recurrences, promoting healing in suppurative and serious cases, and frequently greatly improving the cosmetic results."

OPERATIVE TREATMENT. Surgical treatment of tuberculosis of the neck lymphatics is practically without immediate mortality, offers an excellent prospect of cure, and does not jeopardize any important tissues or organs. I do not, however, advocate an operative resort in all cases, as such a course seems to me altogether too radical, although it may have many earnest advocates. In incipient cases I would investigate the nasal, buccal, and pharyngeal cavities, and, after eliminating all disease of the portals of entry, would apply the usual rules of hygiene and feeding. Bier's hyperemia and opsonotherapy would also, as has been mentioned, be considered. We should also decline to operate upon patients who already have advanced pulmonary tuberculosis. With these exceptions, surgery offers the only definite prospect of cure. The outdoor life may for a time cause an improvement, but the persistence with which such patients react to tuberculin and the opinions of those in control of sanatoriums seem to show that this form of tuberculosis is peculiarly refractory to hygienic, medicinal, and climatic forms of treatment. The well-known statistics of Dowd,¹ Jordan, Wohlegemuth, Blos, and Mayo, something over 1500 operations without mortality, show the safety of the operation.

Dowd offers in explanation of the elimination from the risk of any injury to the surrounding structures: "(1) The important structures are in the soft parts, and can usually be separated from the diseased tissues without injury. (2) The infection here is almost uniform in its development, first showing itself in the subparotid nodes and then spreading in the lymphatics downward and backward, and occasionally forward. The dissection, therefore, can be carried on in a perfectly uniform and definite manner, and can be done satisfactorily in the stage of the disease in which the majority of the cases are now referred to the surgeon."

A special note should be made, in connection with operations for tuberculous lymph nodes, of the surgeon's duty to ascertain whether there be the least suggestion of a focus in the lungs. If there is, chloroform should be used invariably. I have seen disastrous results from the irritating effect of ether vapor on subjects in whom the existence of phthisis was not suspected. For this reason we should insist upon a most rigid examination of the lungs before selecting our anesthetic.

¹ In his most recent paper Dowd records 1 death in 275 operations.

Whether one or both sides are operated on at one sitting will depend upon the general condition of the patient and the extent of involvement. As a rule, I prefer to perform the operation in two sittings. In the selection of the plan of operation one should always bear in mind how difficult and more often impossible it is to form an accurate conception as to the extent of the glandular involvement. What upon examination appears to be a rather small mass more or less circumscribed proves at the operation to be very much larger and widespread. This is particularly true of those nodes situated behind the sternocleidomastoid muscles and beneath the deep cervical fascia and behind the parotid.

Ultimate Results. Dowd records the postoperative result of his 275 cases treated by radical extirpations; 50 of these were not traced, or have had their operation very recently. Tabulated, these results are: Group 1, 54 cases followed five to thirteen and one-half years; apparent cures, 98 per cent. Group 2, 42 cases followed three to five years; apparent cures, 88 per cent. Group 3, 87 cases followed one to three years; apparent cures, 83.8 per cent. Group 4, 92 cases followed less than a year; apparent cures, 85.8 per cent. Forty-six cases (16.7 per cent.) required secondary operations, the majority being in the severe type, who had very extensive infections.

Bilateral Ligation of the Internal Jugular Vein. Duval¹ reports a case where he was obliged to resect the internal jugular vein on both sides of the neck in the performance of excision of a cancerous mass. Intense congestion of the face and neck, and temporary cessation of breathing resulted, but no permanent ill effects were noted. Morestin² reported two fatal cases where the same procedure was carried out, and suggests that if such be necessary the occlusion should be done gently and gradually, and that either the internal carotid should be ligated or the common carotid occluded at the same time. He suggests the propriety of reconstructing the internal from the external jugular by vascular interposition. G. P. Muller has resected both internal jugulars at an interval of two weeks in a case of tuberculous lymphadenitis from my wards without noting any ill effects.

Ligation of the External Carotids. When severe and extensive operations are required either on the face or neck, in order to control hemorrhage, ligation of the carotid frequently has to be done. Which vessel, the common or the external carotid, should be chosen, is discussed by Fisk.³ He reports seven ligations of the external carotid in 4 cases, and concludes that not only does such ligation more thoroughly control the hemorrhage than does ligation of the common carotid, but there is also less probability of secondary hemorrhage and no fear of brain complications. He ligates between the superior thyroid and lingual

¹ Bull. et mém. Soc. de Chir., No. 7, 1909.

² Ibid.

³ Annals of Surgery, June, 1909, p. 767.

branches, and determines the origin of the ascending pharyngeal, which, if at the bifurcation of the common carotid, must also be ligated.

Ludwig's Angina was considered at some length last year when I reviewed the excellent paper of T. T. Thomas. A very interesting example of this disease, associated with facial carbuncle and parotitis, is reported by Walters, Coombe, and Jolly.¹ The interest lies in the fact that treatment was confined to the use of vaccines and the administration of citric acid; the latter, by lowering the coagulability of the blood, permitted lymph containing antibacterial and antitryptic bodies to more freely circulate in the infected tissue and destroy the microorganisms before tissue destruction took place. Williams² reports two cases of Ludwig's angina, both of which recovered; in one it was thought that the infection was due to the colon bacillus.

The Carotid Gland. In 1906 Keen and Funke³ reported an example of a carotid gland tumor, and collected 26 cases from the literature which had been subjected to operation. Douglas,⁴ in reporting a perithelioma of the carotid, brings the total to 32, and notes that 8 patients died as a result of operation, an immediate mortality of 25 per cent.; 6 suffered a recurrence. The pneumogastric, sympathetic, lingual, hypoglossal, facial, recurrent laryngeal, and superior laryngeal nerves have been injured during operation, and because of such injury, as well as the high mortality, Keen and Reclus and Chevassu have urged conservatism. But Douglas points out that the usual course of these tumors is a slow one, and only after a long time do they become rapid growing and malignant, hence an early operation is more apt to be successful than a late one; furthermore, most of the reported cases were undiagnosed, and by calling attention to the existence of these tumors the operator in the future will be better prepared to deal with the growth from an anatomic standpoint.

In view of these facts, Douglas states, in conclusion: "While recognizing that there may be a certain number of cases where a large but slowly growing tumor, without evidence of malignancy, exists in a patient whose age or whose general or arterial condition would make the danger of postoperative shock or of brain disturbance after ligature of the carotids especially great, in whom operation would be inadvisable, it would appear to the writer that instead of advising against operation in all cases until rapid growth or malignancy occurs, more good could be accomplished by an effort at early diagnosis and removal of the tumor, while the risk is less and the prospect of lessened mortality and of an ultimate cure without recurrence greater."

¹ Lancet, July 17, 1909, p. 145.

² New Orleans Medical and Surgical Journal, July, 1909, p. 32.

³ Journal of the American Medical Association, 1906, p. 469.

⁴ Medical Record, March 6, 1909, p. 397.

Licini¹ reports an example of this tumor from Kocher's clinic in Bern, which before operation was thought to be a tuberculous node. He discusses the symptomatology, diagnosis, and treatment, but does not offer anything not contained in Keen's paper.

THE THYROID GLAND.

Aberrant Thyroid. Cushway² reports a case in a woman, aged twenty-six years, from whom a small tumor, the size of a walnut, was removed from the neck and found to be identical in structure with the thyroid gland. It was on the left side opposite the hyoid bone and entirely free from the thyroid. The author remarks that aberrant thyroids may be classified, from the standpoint of embryology, as (*a*) median, formed from remnants of the thyroglossal duct; (*b*) lateral, from remnants of the lateral anlagen of the thyroid. They may be suspected clinically when a tumor is noted in the anterior or lateral triangles of the neck; this tumor occurs most frequently in women, often first appears at puberty, and often tends to increase in size during the period of menstruation. The growth is usually slow and without attendant symptoms unless cyst formation takes place.

Lingual Thyroids. The persistence and development of thyroid remains in the posterior third of the tongue is not uncommon. These tumors vary in size from that of a cherry to that of a hen's egg, and cause more or less serious obstruction to swallowing and alterations in speech. If small, they are usually destroyed with the cautery after splitting the overlying mucous membrane, but if large, they must be excised. Subhyoid pharyngotomy is often practised, but according to Stuart-Low³ the opening between the mouth and neck favors septic infection, the danger of cutting the superior laryngeal nerves and the prolongation of convalescence also make this method of approach generally undesirable. He has accordingly devised and carried into execution the following operation: "Under chloroform anesthesia laryngotomy was performed, and the pharynx being firmly plugged with a captive sponge, the anesthetic was administered through the tube. The tongue, being well protruded from the mouth by means of two deeply inserted stout silk cords, was split from tip to base, and in this way the tumor, which was the size of a small Tangerine orange, was effectively exposed. The growth proved to be solid, and was enveloped in a firm, thick capsule; it occupied nearly all the region of the base of the tongue, the structure being so stretched and attenuated

¹ Deut. Zeit. f. Chir., Band xcvi, S. 327.

² Annals of Surgery, January, 1909, p. 56.

³ British Medical Journal, May 22, 1909, p. 1225.

over it that there was considerable danger of the whole tongue coming away during the extrusion of the mass. Part of the capsule, very deeply situated near the hyoid bone in the vicinity of the thyrolingual duct, had to be resected. The tongue was then stitched up from tip to base, drainage being provided for. Rectal feeding was given for two days, the patient making an uninterrupted recovery and leaving the hospital on the sixth day."

True Accessory Retropharyngeal Thyroid. Klaus¹ reports an interesting example of this rare tumor occurring in a girl, aged nineteen years, who had suffered from dyspnea and dysphagia for some time, followed by the appearance of a tumor in the throat. It was removed through the neck and was cystic in character. These retrovisceral tumors are divided into two groups—(1) those developing from one of the lobes of the thyroid and occupying a position between the trachea and esophagus, or behind them, and (2) those not connected with the thyroid, but developing from the same primitive origin as the thyroid and remaining in the region of the pharynx. Clinically they may be suspected when a long-existing tumor in the pharynx, covered with normal epithelium and moderately interfering with breathing and swallowing, suddenly increases in size (due to hemorrhage in the cyst) and seeming at first thought to be malignant. They should be dissected out by an incision posterior to the sterno mastoid.

Intrathoracic Goitre. Kreuzfuchs² reports two cases of intrathoracic goitre which were easily diagnosticated by the *x*-rays. He discusses the condition and believes that these goitres may be classified as cervical with intrathoracic extensions, or as purely intrathoracic goitres. The latter are rare and usually overlooked. They may be retrosternal or retrovasal (Kienbock), or may be situated more or less behind one or other clavicle. There may be no symptoms, or if present they will be those of pressure or perverted function. Dyspnea and stridor without obvious cause should lead to the suspicion of an intrathoracic goitre. Dilated veins over the upper part of the thorax and dulness over the upper part of the chest are of value. The sympathetic and vagus nerves, especially the recurrent laryngeal branch of the latter, may be affected, the great vessels may be pressed upon and dysphagia may be present, but is uncommon. The *x*-rays reveal a shadow continuous with that of the heart and great vessels and representing an enlargement of the upper part of that shadow. Above, it is usually continuous with the shadow due to the neck. It moves considerably with deglutition. Kreuzfuchs suggests that many cases with symptoms of Basedow's disease, but without an obvious cervical goitre, may be explained by the presence of an intrathoracic bronchocele. He also

¹ Deut. Zeit. f. Chir., January, 1909, S. 37.

² Wiener med. Wochenschrift, July 17, 1909, p. 1673.

criticises a paper by Leech,¹ and believes that his cases were not those of persistent thyroids, but of intrathoracic goitres. This was shown by the enlargement of the thyroid and by the character of the nervous symptoms—tachycardia, dilatation of the pupils, dysphagia, dyspnea, cough, tremors, hyperidrosis, etc.—suggestive of Basedow's disease.

Goitre in the Mother and its manifestations in the offspring are considered at great length by Schmauch,² who also attempts to answer the question, Is Graves' disease inherited or transmitted? He reports a case of exophthalmic goitre of the classical type in a woman, aged thirty-five years. When this woman was twenty-six years old a swelling appeared in the right side of the neck during the later months of her first pregnancy, and increasing in size with each subsequent pregnancy. She suffered from great weakness during her second pregnancy, developed suffocative spells during the third, and became typically exophthalmic during the fourth. The children showed a gradually increasing deterioration, increasing at the same pace as did the disease in the mother. The first child, born while the mother acquired the disease, is apparently normal, the second shows signs of rickets, the third has an immense head and resembles a cretin in appearance, the fourth child has an irregular cranium, exophthalmos, myxedematous folds in skin of the neck and chest, large abdomen, etc., and is considered by Schmauch to be a type of "forme fruste" of myxedema.

The author believes in the early induction of abortion in serious cases of Graves' disease, especially when there is already one child, when an enlarged thymus is also present, and in all cases where there is evidence of pressure on the trachea or esophagus. He discusses the influence of the mother's disease upon the child's nutrition, and believes that the fourth child in the reported case did not inherit his pathological condition—he acquired it intra-uterine. He therefore believes that Graves' disease is not inherited, but is occasionally transmitted to the children, giving rise to temporary disturbances, such as rickets and myxedema, which may, however, be prevented by appropriate treatment of the mother.

Thevenot³ discusses in detail the subject of goitre and congestion of the thyroid in the newborn. As a rule, operation is not indicated, but where required he believes exothyropexy is the preferable technique, possibly supplemented by an incision in the isthmus to hasten subsidence of the congestion. It is curious how French surgeons cling to this barbarous and antiquated operation.

Acute Thyroiditis. Weber⁴ reports a case of primary infection of the thyroid gland, and discusses the symptoms, diagnosis, and treatment.

¹ Medical Record, March 6, 1909.

² American Journal of Obstetrics, 1909, vol. lx, p. 1.

³ Obstétrique, March, 1909, p. 230.

⁴ Revue méd. de la Suisse Romande, 1909.

He believes that acute thyroiditis must be secondary to some unrecognized condition such as a slight angina, catarrh of the respiratory tract, or infections from the intestinal canal. The disease is most frequent in women, most common between the ages of thirty and forty, has an abrupt onset with a rigor, and progresses from one lobe to the other. The chief symptoms are severe neuralgic pains radiating to the ear, neck, jaw, or shoulder, pain on deglutition, respiratory pain, cough, and hoarseness. The duration is from three to six weeks, the prognosis good, and treatment consists of rest, cold applications, the administration of antipyretics, and finally surgical intervention, if required.

Hydatid Cysts of the Thyroid Gland. Ultzmann¹ reports two cases of this rare affection, and states that there are only twenty-three others in the literature. The cases reported were monocular cysts situated in both cases in the right lobe of the thyroid. The etiology is hard to determine, only four of the cases in the literature showing clearly any close association of the patient with dogs or cats. The cysts are generally easily enucleated. A bibliography is appended.

Goitre. The different enlargements of the thyroid gland, commonly called goitre, have for many years given rise to a large number of classifications, based variously upon the morphology or histogenesis, depending upon the caprice or trend of thought of the author of the investigation and to an almost endless discussion of their respective merits. In view of our comparative ignorance of the exact physiology of the thyroid, and of our failure as yet to determine the stimulus which excites its hypertrophy or hypersecretion, the simplest scheme would seem the best.

McCarthy,² after examining 700 specimens with their case histories, proposes still another grouping which he thinks superior to those we now have. He believes that the process known as goitre may be expressed as an attempted reversion of the thyroid to its original function, and stimulated to activity by the same substance which stimulated it to activity in the primitive man. This stimulus may still be present in the food or water, formed through some process in the intestine or in the metabolism of the body, or it may exist in the air. As a result, the thyroid being ductless, there would be a cyst formation or absorption of the products produced. In the ordinary simple or colloid goitre, which he terms cystic goitre (*thyroidea cystica*), there is an excess of secretion and production of colloid without an equal amount of absorption. In those types of increased parenchyma with absorption of the secretion usually termed exophthalmic goitre, a bad term I admit, he separates the uncomplicated parenchymatous hypertrophy (*thyroidea parenchymatosa hypertrophica*) from that with the papillary ingrowths

¹ Wiener klin. Woch., May 20, 1909, S. 716.

² American Journal of the Medical Sciences, June, 1909, p. 806.

(thyroidea cystica papillæ), the latter including those simple or cystic goitres which develop symptoms of hyperthyroidism. The cretin's thyroid is termed thyroidea fetalis hypertrophica, and the common nodular or adenomatous goitre of fetal type is a thyroidea fetalis adenomatosa.

SURGICAL TREATMENT. Operation upon cases of simple goitre, colloid or adenomatous, has become, with increased knowledge and better technique, almost as safe as that upon chronic appendicitis or uncomplicated hernia. But as compared with European clinics, notably that in Berne, a ridiculously small number of goitres are operated upon in this country, except by C. H. Mayo and perhaps in the basin of the Great Lakes and in the Northeast region, where they are more abundant. This state of affairs does not depend upon the infrequency of thyroid lesions altogether, but partly, I believe, to the fact that many practitioners are not familiar with the advances which have been made in this field of surgery. As C. H. Mayo puts it, "the advice of the old family physician is still respected by many patients, to the effect that if they were operated death would probably result, or should they recover they would run the risk of developing some hideous skin disease, 'myxedema,' or that they might become 'foolish,' the latter warning usually being quite effectual in helping them determine as to their procedure." Mayo¹ himself reports having operated on 574 cases of simple colloid or diffuse adenomata, including encapsulated goitre, adenoma, and cyst adenoma, including 4 operations for accessory thyroids, 1 being a lingual thyroid. There were only 4 deaths in this series, a mortality of less than 1 per cent.—2 from pneumonia, 1 from hemorrhage, and 1 from shock.

Schloffer² records his experience in Innsbruck during a period of five and one-half years. There were 452 operations performed, of which, 427 were for benign goitre, including 20 Basedow and 10 strumitis cases. There were 6 deaths, 5 of these being simple goitre cases (1.3 per cent.) and 1 malignant. Dyspnea was present in 386 cases, dysphagia in 37, goitre heart was noted 28 times, chronic bronchitis 31 times, and valvular heart trouble in 42 cases, and yet despite these complications the mortality of the simple goitre operations was only 1.3 per cent.; 1 death was an epileptic, 1 a cretin, and 3 were of the group "enormous goitres with severe tracheal stenosis." A laryngological examination was made in 373 patients before operation, and of these, 299 had stenosis and 26 of them had no subjective symptoms. In 73 cases a scabbard trachea was observed. In no case was tetany or cachexia strumipriva observed after operation, but in 12 cases disturbance of the recurrent laryngeal was noted.

¹ Surgery, Gynecology, and Obstetrics, March, 1909, p. 237.

² Med. Klinik, September 19, 1909, p. 1431.

Wainwright¹ reports his personal experience in the surgery of simple types of goitre, based on 18 cases. Divided according to their pathology, 7 of the cases were simple cysts, 2 were adenomas with cysts, 7 were enlargements of the parenchymatous type, 1 was of the exophthalmic type, and 1 was a carcinoma. All of the patients recovered from the operation, and 17 have remained alive and well, 1 dying of a very rapid recurrence of malignant goitre five weeks after operation. In 4 cases the tumor was simply shelled out, in 10 a unilateral thyroidectomy was done, and in 4 the entire thyroid, except for a small portion left to perform function, was removed. In no case was tetany observed; one patient developed myxedema which subsided in two weeks, and another suffered from postoperative hemorrhage. The after results were all that could be desired. As a result of this experience Wainwright believes that ether should be the anesthetic of choice and preceded by a dose of atropine, that the operation is as safe as that for hernia, that all simple goitres causing pressure or progressively enlarging should be operated on, and that the amount of gland removed should be suited to the circumstance of each individual case. Legg,² in 21 simple goitre operations without mortality, had no complications except slight suppuration in 1 case.

Exophthalmic Goitre. The literature upon this topic is accumulating rapidly, but, as I remarked last year, we have attained but little real knowledge of the physiology of the thyroid gland itself, and until such knowledge is acquired the discussion upon hyperthyroidism must, perforce, be limited to statistical matter and arguments pro and con upon treatment by operation. In an elaborately illustrated article Wilson³ discusses the pathological changes in the thyroid gland as related to the varying symptoms in Graves' disease, based on 294 cases obtained from operations and autopsies in St. Mary's Hospital, Rochester, Minn. He divides the cases into two groups, those essentially with increased parenchyma within alveoli, and those with increased number of alveoli. These are each subdivided, exactly alike, depending upon the amount of secretion, its tinctorial properties, the degrees of parenchyma proliferation, and the extent of the degenerative changes. The pathological groupings were then compared with the clinical findings, and in 80 per cent. an almost complete parallel was found to exist.

In a later paper, Wilson⁴ states "that all early acute cases of Graves' disease, of whatsoever grade of severity, show unmistakable evidence of increased secretion by the gland and of increased absorption from it. It matters not in what form the increase of functioning parenchyma occurs, so long as there is such an increase associated with

¹ *Therapeutic Gazette*, December, 1908, p. 846.

² *Practitioner*, November, 1909, p. 676.

³ *American Journal of the Medical Sciences*, December, 1908, p. 851.

⁴ *Surgery, Gynecology, and Obstetrics*, June, 1909, p. 588.

unblocked lymphatics the train of symptoms best designated hyperthyroidism is present. More than this, the relative amount of increase of working tissue and absorbable secretion is almost invariably paralleled by the degree of severity of the symptoms. Later in the history of any case of exophthalmic goitre, when for any reason the parenchyma cells are decreased in function, either from overwork, pressure or insufficient blood supply, or when lymphatic drainage is blocked either from increased connective tissue, the result of reaction to endogenous irritants or from medical or surgical interference, it will be found that the symptoms of thyroid toxemia begin to remit. Finally, when glands removed in cases of previous hyperthyroidism are found to consist of acini, lined with flattened or desquamated epithelium, and filled with a thick gelatinous non-absorbable colloid, a careful study of the symptoms of the case will show that the patient is suffering from lesions of vital organs—heart, central nervous system, etc.—which were produced by a long-passed thyroid toxemia.” Wilson, in this paper, very comprehensively describes the difference between simple goitre and exophthalmic goitre by stating that “a case of Graves’ disease is one with an enlarged thyroid and exhibiting symptoms of too much absorbed thyroid secretion, while a case of simple goitre is one with an enlarged thyroid, but exhibiting no such symptoms.”

McDonald¹ also discusses the pathology of this affection, and concludes that the symptoms are due to the excessive activity of the gland the seat of characteristic changes indistinguishable from hypertrophy. He asks, “Why should the process of hypertrophic compensation, elsewhere a beneficent and reparative function, here so far overstep its authority as to produce a symptom complex which is certainly pathological?” He believes the overcompensation to be a response to the continued action of certain toxins or stimulation bodies. The thyroid gland, however, is one of extremely complex function, and to simply assume that its parenchymal hypertrophy exerts a vicious action is, I believe, to reason inaccurately from the true state of affairs. Hypertrophy can be produced in dogs by excising a portion of the thyroid, and there is a constant hypertrophy of areas of acini in simple goitre. Moreover, if hypertrophy *per se* were the cause of the symptom complex, surgical treatment would be contra-indicated except to relieve dyspnea. It is the absorption of the secretion from the hypertrophied gland that is the source of trouble, and as one lobe is usually more profoundly affected than the other, the removal of that better enables the organism to recover its balance of the interrelated internal secretions. As C. H. Mayo² states, “the surgical treatment of hyperthyroidism must embody methods of reducing the secretion of the gland.” This

¹ Journal of the Indiana State Medical Association, May, 1909.

² Surgery, Gynecology, and Obstetrics, June, 1909, p. 602.

may be done by ligation of the vessels or by the removal of a varying quantity of the gland.

Mayo describes his operative technique as follows: In ligating the vessels a transverse incision is made in a skin crease crossing the thyroid cartilage and the wound is deepened to the gland between the omohyoid and the sternomastoid muscles. All of the branches of the superior thyroid artery and the superior veins are secured at the apex of the lobe in one mass of linen ligature. In some cases this may include a bit of the upper pole. In enucleation and excision he employs the usual technique and lays emphasis upon the trapdoor exposure which aids in the elevation of the gland. The latter is incised along its outer borders with the dissecting scissors and the tissues brushed down with gauze as the gland is dissected, catching the vessels as seen. The inferior thyroid artery may be caught before it reaches the capsule. The gland is then rotated over the midline of the neck, preserving the capsule and deeper tissues, recurrent laryngeal nerves, and parathyroid glands from injury. There seems to be but little danger from rough handling of the gland removed if the portion which is to remain is preserved from injury. Drainage is always inserted, saline solution given after operation by the rectum, and morphine and atropine administered if required.

Dunkill¹ has operated upon 88 patients afflicted with Graves' disease, and makes some interesting observations in regard to the technique. He has had but one death. He prefers local anesthesia in order to avoid the recurrent laryngeal nerve, and to prevent vomiting and retching, which may be provocative of hemorrhage. He believes that in many cases the removal of one lobe and the isthmus is not sufficient, because if the other lobe is also affected the gland tissue remaining is still sufficient to poison the individual, causing some tremors and palpitation on exertion, and the pulse rate may still remain high. In such cases, part of the second lobe should be removed after a period of several months. He regards the common practice of crushing the isthmus as quite unnecessary and exceedingly dangerous, causing an increase in the pulse rate for some days. If the crushed stump is also closed over, as is commonly done, the only exit of the bruised and disorganized tissue is through the lymphatics and vessels of the gland. There is nearly always a division more or less fibrous somewhere through the isthmus, easily found, and when divided resulting in but little bleeding. He finally pleads for early operation, "as soon as it is seen that medical treatment is not affecting a cure, for with local anesthesia, rapid operating, no crushing, and free drainage, the operation may be regarded as absolutely safe."

Ferguson² records his experience in 42 cases of exophthalmic goitre

¹ British Medical Journal, May 22, 1909, p. 1222.

² Surgery, Gynecology, and Obstetrics, March, 1909, p. 279.

with 3 deaths, 2 of them being due, in his opinion, to mental excitement. He describes the following variation in the usual technique: After opening the capsule he finds a free space in the centre of the gland (*i. e.*, at the isthmus), and passes a long, blunt pedicle needle through the gland from without inward and downward, for the inferior thyroid vessels, and then inward and upward, so as to surround the superior vessels, being careful to pass through the parenchyma of the gland, and not too close to the trachea. A stout catgut ligature is drawn through in each case and tied, thus leaving a button of thyroid tissue at each angle in place of the old method of leaving a large mass of tissue in one place. The gland can then be cut away.

The Psychic Factor. I¹ have previously discussed Crile's contribution and the method whereby he "steals" the gland from the patient, in some cases so successfully that "the patients were discharged from the hospital without knowing that the gland had been removed." Recently² he has been able to successfully show the influence of the psychic factor in two dogs with hyperthyroidism, and thereby confirm in the laboratory the clinical observations previously made. After observing the dogs for several days to determine the morbid phenomena, they were frightened in various ways and exhibited after about six hours a marked rise of temperature, tachycardia, trembling, and gastro-intestinal symptoms. The temperature then gradually fell, the mental symptoms subsided, the tachycardia diminished, and the dog returned to his former condition. Fear produced the same effect; anesthesia after excitement was followed by hyperthyroidism. The experiment was then tried of injecting the expressed juice of the thyroid gland in varying doses into these and normal dogs. In the dogs with Graves' disease the symptoms appeared and lasted longer and with greater severity than in the normal dogs. The juice of other organs, the liver, kidneys, etc., was also administered, but produced no symptoms that could be confused with those of Graves' disease.

Cervical Sympathectomy. The performance of this operation has practically been abandoned, and rightly so, in the treatment of hyperthyroidism. The enthusiastic claims of Jaboulay, Jonnesco, Curtis, and others have not been sustained by clinical or experimental observation. Recently, Casagli³ describes some experimental work on the behavior of the thyroid gland after sympathectomy, performed on rabbits five or six months old. He fails to find any evidence in favor of fibers in the sympathetic inhibiting secretion in the thyroid or having any direct influence upon the secretory functions of the gland. He therefore concludes that there is no rational basis for the functional

¹ PROGRESSIVE MEDICINE, March, 1909.

² Journal of the Indiana State Medical Association, June 15, 1909, p. 230.

³ Il Policlinico, June, 1909, p. 241.

suppression of the cervical sympathetic in the treatment of exophthalmic goitre.

Thyroid Transplantation. The literature upon this topic is gradually increasing in amount and in value, and an increasing effort to apply the experimental work to clinical problems can be noted. Thus, Bramann¹ reports three cases of myxedema and cretinism where transplantation was done with marked benefit and improvement of the intelligence; Bircher,² however, reports unfavorable results in three cretins, as the thyroid tissue seemed to be unable to resist absorption in time. As a consequence he concludes, that the relation between the thyroid and cretinism is not one merely of hypothyreosis or athyreosis; Carraro³ experimented with thyroid transplantation and made observations of the fate of the graft from the second to the thirtieth day. He obtained the best results by transplanting thin disks of thyroid tissue implanted in the subcutaneous tissues. One side of the transplanted piece must be still covered with some of the connective tissue capsule of the thyroid gland to insure its vitality. Salzer⁴ also claims that the best results will be obtained with repeated implantation of small scraps into the subcutaneous tissues or in the peritoneal tissue.

Carrel⁵ sums up the subject as follows: "The treatment of hypothyroidism and athyroidism by transplantation of the thyroid is more immediately promising of practical results. The feasibility of the operation has been already demonstrated. The actual problem is to render it ordinarily successful. Success in transplantation depends on two factors, biological and surgical. We are still ignorant of the biological factors of success and failure in transplantation of tissues between animals of the same species. We do not know exactly what are the interactions of the organism and its new organ. It is certain that, at least in some cases, the gland adapts itself to its new owner, does not undergo any marked histological changes, and functionates normally. But we do not know how frequent are the cases in which the new tissue and its host will have a pernicious influence on each other. The surgical factors can be probably controlled. It must be hoped that the technique of the graft by simple implantation will be improved. The operation is very much simpler than the transplantation with anastomoses of the vessels. However, if it is found that it cannot be frequently successful, the transplantation of large pieces of thyroid with union of the vessels to the vessels of the patient must be attempted. In this indirect manner vascular surgery may improve the results of the treatment of hypothyroidism and athyroidism."

¹ Deutsche med. Wochenschrift, October 7, 1909, S. 1738.

² Deut. Zeit. f. Chir., January, 1909, S. 75.

³ Ibid., February, 1909, S. 201.

⁴ Wiener klin. Woch., March 18, 1909.

⁵ Surgery, Gynecology, and Obstetrics, June, 1909, p. 606.

Pressure Atrophy of the Thyroid Gland. Werelius,¹ working on the hypothesis that if an atrophy of the gland could be produced, thus diminishing the number of secreting cells, there would be a resulting diminution of secretion and consequent alleviation or cure of hyperthyreosis, has devised such an operation. He has succeeded experimentally in dogs, and in one case of goitre in the human being, in producing atrophy by means of a purse-string suture introduced deep into the parenchyma and carefully avoiding the superficial vessels. The unoperated gland atrophied almost as much as those operated on, not only in the dogs, but also in the human case. Werelius believes the operation may be very useful in "desperate cases."

Thyroidectomy for Cancer. Stuart-Low² proposes the fanciful idea that the thyroid may be regarded as the flywheel of body growth and metabolism, that this organ may be overworked, and in certain cases may be a causative factor in the origin and continuation of malignant disease. He therefore proposes the removal of the thyroid in cases of inoperable cancer as the best means of eliminating or ameliorating a disturbing factor in the diseased organism of the carcinomatous. In five cases in which this was done the primary growth ceased enlarging, the nodes become softer and less painful, the patients gained weight, and there was distinct slowing of the pulse.

Thyroidectomy in Dementia Præcox. Kanavel³ concludes that while one cannot assume any distinct pathological basis for ascribing dementia præcox to a distinct hyperthyroidism similar to Graves' disease, the pathological picture cannot definitely exclude a perverted thyroid metabolism as a factor. Partial thyroidectomy is absolutely of no avail in old cases, but Kanavel has had two greatly improved by it when in the early stage, and as the disease is so hopeless believes that further experimentation should be done.

The Parathyroid Glands. There is nothing particularly new to report this year of these glandules. C. H. Mayo⁴ reiterates his well-known views, and states that in 1200 operations for goitre he has seen no *tetany*. Should tetany follow a thyroidectomy, calcium lactate should be administered, as it seems definitely settled that after parathyroidectomy there occurs an increased elimination of calcium in the urine and feces, which results in a marked reduction in the calcium content of the tissues, especially of the blood and brain.

In a recent paper MacCallum and Voegtlin⁵ have reported that salts of potassium and sodium have no favorable effect on tetany, while any beneficial effect the magnesium salts may produce is masked by their

¹ Journal of the American Medical Association, July 17, 1909, p. 172.

² Lancet, October 16, 1909.

³ Illinois Medical Journal, September, 1909.

⁴ Annals of Surgery, July, 1909, p. 79.

⁵ Journal of Experimental Medicine, vol. xi, p. 118.

toxicity. Canal¹ confirms this work by experiments showing that fractures healed very slowly in animals after removal of all or part of the parathyroids. I² have given previously the views of W. S. Halsted upon this question. In a more recent paper,³ practically an elaboration of the one read before the Philadelphia Pathological Society, he suggests that when a parathyroid body has been cut off from its blood supply, it should be transplanted into the remaining lobe of the thyroid.

Thymus Gland. The subject of thymic hyperplasia has a certain degree of interest to surgeons by reason (1) of the number of cases of sudden death which occur in their hands under anesthesia, and (2) because of the suggestion of Capelle and others that a pathological enlargement of the thymus should be recognized and in certain cases treated by excision. I discussed this subject rather briefly last year, and find in the recent literature some valuable articles discussing the pathology of thymus hyperplasia. Howland⁴ and Warthin⁵ present two splendid articles, and Hart⁶ analyzes 158 articles in the literature. Warthin sums up the whole question by assuming that we must believe in the occurrence of a true thymic asthma and thymic death, the latter being due often to a compression of the trachea resulting in an acute suffocation. In other cases the cause of death remains unexplained, the picture being that of cardiac death. The first form occurs chiefly in young children and infants, the second in adults. In the first case the symptom complex of the so-called lymphatic constitution may or may not be present, yet by the majority of writers the thymic hyperplasia is assumed to be the cardinal feature of the status lymphaticus, only a few drawing a distinction between them. In his conclusions, Warthin also states that "the underlying lymphotoxemia and its cause may also cause death directly or indirectly. The lymphotoxemia and general hyperplasia create an especial susceptibility and lowered resistance to infections." Leach⁷ believes that the thymus can always be outlined by percussion, the area of dulness being represented by a trapezoid, the lateral sides of which are slightly curved, and which is sometimes not larger than a half-dollar. When enlarged, the symptoms produced are the symptoms of the functional neuroses, hysteria, neurasthenia, and visceral neuroses, and probably of the forms of functional insanity, mania, melancholia, and paranoia. He terms the affection "thymokesis," suggests surgical interference in severe cases, and presents eight illustrative cases. Finally, the medicolegal

¹ *Gaz. d. Ospedali e delle clinici*, August 5, 1909.

² *PROGRESSIVE MEDICINE*, March, 1909.

³ *Journal of Experimental Medicine*, 1909, vol. xi, p. 175.

⁴ *Proceedings of the Philadelphia Pathological Society*, September, 1909, p. 267.

⁵ *Archives of Pediatrics*, August, 1909, p. 597.

⁶ *Grenzgebiete d. med. u. Chir.*, July 30, 1909.

⁷ *Medical Record*, March 6, 1909, p. 391.

aspects of this subject are important in view of the following: Daukes¹ reports the case of an adult woman, who when pursued by her husband, who threatened her life, fell and never moved or uttered a sound again. Her husband then kicked her. At the autopsy a persistent thymus was present which Daukes seemed to think was a predisposing factor in her death. The body otherwise was normal.

The Thoracic Duct. In these days of radical operation for malignant disease involving the neck and extensive dissections of the glands in tuberculous lymphadenitis it is surprising that injury to the thoracic duct is so rare. Perhaps it is more often wounded than shown by the records and passes unrecognized or is considered of little moment. Gobiet² reports a case of such injury occurring during the removal of cervical nodes involved in mammary cancer, which was immediately sutured and no further leakage occurred. He was able to find but 37 cases in the literature, including his own. Of these, 15 occurred during the removal of tuberculous nodes, 10 in node metastasis from breast cancer, 5 in sarcoma of the neck, 3 in carcinoma of the neck, 3 in carcinoma of the thyroid gland, and 1 in aneurysm of the subclavian artery. He urges the use of the suture in closing the wound, after the method of Carrel and Stich, unless technical difficulties are present, in which case the ligature or a clamp left in position should be used. He condemns the common practice of tamponing which has given a mortality of 15 per cent. and 70 per cent. of failures.

THE THORAX.

The Mammary Gland. FIBRO-EPITHELIAL TUMORS OF THE BREAST. While the diffuse variety of mammary affections is notably benign, yet procrastination, even under careful observation, seems scarcely warranted. Cases are constantly occurring in which the clinical evidence of malignancy is slight, or is not suspected, yet such transformation is seen on microscopic examination of the apparently benign tissue or tumor removed. It would seem much more reasonable to operate upon all diseased breasts, the extent of the operation depending upon the character of the tumor disclosed by the incision. While malignancy is more apt to arise in cases of abnormal involution (chronic cystic mastitis) or in the papillary cystadenomata, by reason of the greater degree of epithelial hyperplasia, yet other forms of benign disease are at times associated with malignant transformation.

Kuru³ has studied the epithelial changes in the breast at various

¹ British Medical Journal, January 2, 1909, p. 10.

² Wiener klin. Woch., June 10, 1909, p. 816.

³ Deutsche Zeitschrift f. Chirurgie, Band xlviii, Heft 4 and 5, and Arch. f. klin. Chir., Band lxxxviii, Heft 1.

periods in its development, and concludes that fibro-adenoma may undergo a carcinomatous degeneration. The epithelial cells, in a state of active adenomatous proliferation in these cases, soon grow beyond a physiological process and, penetrating the underlying structures, become malignant. The conclusions which can be drawn from these studies simply enforces anew the well-known fact that all tumors in the breast present possibilities of malignant degeneration, and demand, therefore, early removal.

In his study of the benign affections of the breast, their origin and degenerations, Kuru summarizes his observations somewhat as follows: (1) The fibro-adenoma, cystosarcoma phyllodes, and chronic cystic mastitis form a group of diseases of the breast which arise from the same histological changes. The growths become differentiated by the predominating proliferation of epithelium in certain cases, or by the connective tissue hyperplasia in others. (2) The original process is to be regarded as neither an inflammation nor tumor formation, but as a degeneration of fibro-epithelial character. Thus, by proliferation of one of the tissues or through a circumscribed hyperplasia of one of the elements, a true tumor formation may develop, which is designated fibro-adenoma phyllodes, fibrosarcoma phyllodes, or papillary fibro-adenoma. (3) Conditions analogous to these formations are seen in the cystic degeneration and the cyst formation in the ovary, in prostatic hypertrophy, and especially in struma. (4) The initial changes are found in the parenchyma, and consist in an abnormally active proliferation of the epithelium, with the formation of small cysts. Changes in the connective tissue are encountered at an early date, which, however, never show an inflammatory character. From this stage, until sarcomatous degeneration of the connective tissue arises with pure sarcomatous metastasis, or carcinomatous degeneration of the epithelium and pure epithelial metastasis, all intermediate degrees are found. (5) The appearance of the so-called pale cells (*blasse epithelien*) is no indication of malignancy, but indicates merely a marked increase in the proliferative power of epithelium. A polymorphous condition of the nuclei, even with an intact basement membrane, is an indication of beginning malignancy. (6) Functional disturbances and preëxisting infections have little or no influence in the etiology. The early stages of the disease, in many instances, can be traced to the time of puberty. (7) While a provisional diagnosis can be made from the clinical symptoms at the time when we first see the patients, yet the presence or absence of malignant degeneration cannot be determined clinically. (8) It follows from this that all circumscribed forms of disease should be operated upon immediately. Delay may be practised, under constant observation, in cases of a diffuse or bilateral process, and when symptoms of malignancy can be absolutely excluded. (9) The histological examination should include sections from many different

areas, since the malignant process may be limited to a single small area. It is unwise, therefore, to place reliance upon the examination of a single section of tissue removed for histological study, for in many instances such an area will not contain any evidence of malignancy.

TUBERCULOSIS OF THE BREAST. The term "solitary tuberculosis of the breast" should exclude not only cases with a history or evidence of preëxisting tuberculous disease elsewhere, but also those in which the breast condition might be considered secondary to a co-existing lesion, as of the lungs, joints, etc., or as a direct extension from infected axillary lymph nodes. Much difficulty was experienced by von Eberts¹ in reaching a satisfactory estimate of the number of reported cases of tuberculosis of the breast strictly conforming to the term "primary" or "solitary," and he includes, in his review, only those cases in which careful search failed to detect evidence of tuberculosis elsewhere.

The mammary gland probably becomes infected in one of the following ways: (1) Indirect—hematogenous; (2) direct—(a) through the lactiferous ducts and their lymphatics; and (b) through wounds, fissures, or abrasions (cutaneous lymphatics). Two clinical forms of the disease are generally recognized: (1) Nodular, discrete, disseminated nodular; and (2) confluent. In the nodular form of the disease one or more nodules are found, generally deeply embedded in the gland. The disease runs a protracted course, the nodules frequently remaining the same size for years; eventually they gradually increase in size and proceed through the stages of degeneration, suppuration, and fistula formation. The onset is insidious, pain is generally absent in the earlier stages, and the breast may remain unchanged for some time. In the confluent form the onset is more acute; there is greater enlargement of the breast, pain is an early symptom, and degenerative changes, with fistula formation, develop early. It is this form of the disease which is most frequently met with during lactation; in the majority of cases it is centralized beneath the nipple and suggests an infection through the ducts. The breast is freely movable, and fixation of the skin over the foci develops only with degeneration. In both forms of the disease the axillary glands are involved to a greater or less extent, and in 75 per cent. of cases are tuberculous.

The course of the disease in the confluent form is frequently hastened by the presence of a secondary pyogenic infection. To this category belongs that group of cases running a rapid course and often mistaken for simply pyogenic mastitis; the nature of the infection is not recognized until after drainage, the wound fails to heal, and a more or less widespread tuberculous infection, with the persistence of multiple sinuses, renders the diagnosis easy. When the tumor is situated in the deeper parts of the breast, and is associated with retraction of the

¹ American Journal of the Medical Sciences, July, 1909.

nipple, but with no involvement of the axillary nodes, the lesion has been invariably diagnosed as carcinoma. An accurate diagnosis is important, because in tuberculosis the breast need not be sacrificed in every instance; at least, in some instances, vaccine therapy should be tried, and may be combined to advantage with Bier's hyperemia.

While most surgeons advise complete amputation of the breast, together with the removal of the axillary lymphatics, von Eberts believes, that one may be justified in staying operative interference until the effect of a course of tuberculin is ascertained. Cases considered favorable for this plan of treatment comprise those in which the disease is discrete, in which chronicity is a prominent feature, and the possibility of lactation need not be considered. Rodman¹ approves also of this conservative attitude, but if operation is resorted to, he always explores the axilla. There can be no assurance against subsequent involvement of the viscera, joints, etc., even when the diseased area has been extirpated. Therefore, both in cases treated conservatively, as well as in those in which the lesion has been removed, some preventive measures should be adopted. Tuberculin in some form may be administered for a year at intervals of ten to fourteen days, except in the event of the patient developing a hypersensitivity to tuberculin, when it should be discontinued for several months.

MASTODYNIA. Neuralgic conditions in association with scars in the breast are occasionally met with. In these cases the pain is severe, becomes worse on palpation, and on examination a hard nodule of cicatricial tissue can be felt. A properly fitting binder often affords relief in these cases; in other cases passive hyperemia has been tried with a measure of success. There is a type of this disease, however, which has no relation to trauma or preëxisting infection; it is seen often in neuropathic women and, according to Samuel,² is of pure ovarian origin. The pain appears at the time of menstruation, or is increased with the establishment of that function; or if it comes on during pregnancy there are exacerbations at the time menstruation would ordinarily occur. This relationship between the neuralgic attacks and the menstrual epoch is further emphasized by the periodic exacerbations seen at the time of the menopause, or in youth before the function is established. It has been claimed by some that the etiological factor is a secretion elaborated by the ovary. While the exact nature of the secretion is unknown, the condition is generally relieved if the associated neurasthenia responds to treatment.

GANGRENE OF THE BREAST IN DIABETES. This very unusual complication was encountered by Swift,³ and while I have not investigated the matter carefully, I should be inclined to say that the case about

¹ Southern Medical Journal, May, 1909.

² Deutsche med. Wochenschrift, July 22, 1909.

³ Australasian Medical Gazette, January 20, 1909.

to be referred to was the first of its kind on record. The patient, aged sixty-four years, was suddenly seized with agonizing pain in the left breast, which near the nipple showed a blue spot and was intensely sensitive. The process rapidly extended, until in seven days the gangrenous process included an area of 7 x 4 inches, and while the rapid extension of the process made the case somewhat alarming at first, the patient eventually recovered. During the continuance of the fever there was more sugar in the urine, but as convalescence became established not a trace of sugar could be found.

PUERPERAL MASTITIS. The use of Bier's hyperemia in the treatment of puerperal infections of the breast has been fully discussed in previous numbers of *PROGRESSIVE MEDICINE*.¹ Despite the fact, that recent communications have not been quite as optimistic as some of the earlier writings, I still feel that the Bier treatment is peculiarly appropriate and should always be given a trial. To be sure, as Jäger² says, many of the cases not seen until late will go on to abscess formation, whether treated or not. It is thus unfair to expect too much from the treatment, but in early cases the results more than justify our previous endorsement of the method. Comparing the results of passive hyperemia with those measures used prior to its adoption, Jäger's figures speak for themselves; in the 39 cases treated without hyperemia 8 went on to suppuration (20.5 per cent.), whereas in 44 cases in which hyperemia was induced by suction cups only 4 (9 per cent.) went on to the stage of abscess formation.

There is one point in the technique that so often seems to be overlooked, the disregard of which, no doubt, accounts for a good many failures—I refer to the degree of stasis. Three of the first 12 cases in Jäger's series developed abscesses, whereas, with greater experience and care this happened only once in the last 32 patients. It is unnecessary to cause a marked cyanosis beneath the cup, but just enough suction to cause an intense red color. A more advanced degree of stasis will cause circulatory disturbances, and these, in turn, tissue necrosis, whereas, hyperemia of a moderate degree increases the resistance of the tissues without endangering their vitality, and at the same time promotes absorption. After suppuration has occurred the abscess should be opened by a small incision and the pus evacuated by the aid of the suction apparatus. The abscess cavity should be emptied two or three times daily; in a few days the secretion from the wound will begin to diminish and will in a short time entirely disappear. The method has the additional advantage of permitting the children to nurse from the affected breast without doing any damage to either the mother or child. A sterile nipple shield should be applied at such nursing in order to prevent a new infection.

¹ *PROGRESSIVE MEDICINE*, March, 1908, 1909.

² *Deutsche med. Wochenschrift*, April 8, 1909, p. 624.

COLLOID CANCER OF THE BREAST. The results following operation for colloid cancer are much more encouraging than for the other varieties. Thus, the percentage of cures after the three-year interval is about 53, and after five years observation, 51. The peculiarities of this form of cancer have been analyzed by Gaabe¹ from a collection of 2944 mammary carcinomata, of which 49, or 1.66 per cent., were colloid in type. The clinical symptoms and course differ from other varieties of breast cancer in certain particulars; the time elapsing from the beginning of the disease until operation was, on the average, 31.43 months; in other forms of carcinoma, 13.28 months. The slow course is therefore one of the characteristic symptoms of colloid cancer. Adherence of the tumor to the skin and muscle, involvement of the axillary lymphatics, and ulceration of the skin occur much later than in other forms of cancer (two and one-half times on the average). Late recurrence is almost three times as common, but, on the other hand, metastasis to the viscera is infrequent. The expectation of life after operation, even of those who later may die of recurrence or metastasis, is twice as long as in the other types.

OÖPHORECTOMY. The propriety of this operation was discussed some time ago² in connection with an article by Lott. Since that time additional instances have been cited in which inoperable carcinomata of the breast have been favorably influenced by castration. For some reason or other this method is particularly popular with the surgeons of Great Britain, but recently Cahen³ has published an article in which, from an experience of seven cases, he adds his testimony in its favor. The operation should be performed more frequently in young women with inoperable growths, as its favorable influence in certain cases cannot be disputed. In one of Cahen's cases the axillary lymph nodes rapidly disappeared and the patient gained 22 pounds in weight in spite of an incomplete operation. In others, even in the presence of what appeared to be unfavorable conditions, an apparent cure followed amputation of the breast and removal of the ovaries. Two patients remained well and in perfect health for periods of three and one-half years and thirteen months respectively. The best results were obtained in young women; when the patients were over forty-nine, as in three cases, the operation was valueless.

DISSEMINATION OF CANCER. The theory of dissemination of cancer of the breast, known as permeation, has received recognition from both surgeon and pathologist. "Every aggregation of carcinoma cells has a definite life cycle, and after increasing in size for a varying period and at a varying rate, tends spontaneously to undergo degenerative and fibrotic changes. These changes extend from the centre of the

¹ Brun's Beiträge z. klin. Chir., vol. 60, p. 760.

² PROGRESSIVE MEDICINE, March, 1906.

³ Deutsche Zeit. f. Chirurgie, September 6, 1909, vol. xcix.

mass centrifugally to its periphery, lead to its shrinkage, and terminate in the replacement of the aggregation of cancer cells by a fibrous scar." This is the law of cancerous growth formulated by Handley.¹ The natural cure of cancer is to be regarded as a local and not a constitutional process, and, as a rule, it clearly follows up, without overtaking, the centrifugal spread by permeation, and thus fails to arrest the disease. Its vigor in some cases is sufficient to strangle the growth in an early stage or to reduce it to impotence for a long term of years.

The atrophic scirrhus carcinoma of the breast is an illustration of this natural process. In some cases a puckered scar, to which the skin may become attached, slowly forms in the breast, the breast itself becomes somewhat shrunken, the nipple retracts, but no definite tumor appears. The disease is painless, and the patient's attention to the lesion is only attracted by the puckering and adhesion of the skin. Handley believes that many cancers are thus strangled in their infancy, and possibly only a relatively small number reach full development. Consequent upon this primitive self-limiting process there even continue secondary changes. In the first place, the permeative spread of cancer is followed by marked destruction of the lymph vascular system and by contraction of the network of fibrous threads which replace the system of lymphatic vessels, but the most conspicuous secondary change is the perilymphatic fibrosis, a condition which accounts for most of the symptoms, whereby an external cancer may be recognized. In the breast, for example, the retraction of the nipple, the flattening and shrinkage of the breast, the adherence to skin and fascia, are all evidences of fibrosis, or attempts at natural cure. The tendency for carcinoma to draw in the surrounding tissue is but a sequel of this perilymphatic fibrosis. The leathery thickening of the skin of the chest, sometimes seen in mammary cancer, is not due to cancerous infiltration, but rather to a lymphatic edema resulting from destruction of the fascial lymphatic plexus and consequent lymph stasis. The permeation theory explains the condition of the brawny arm associated with cancer of the breast. Here the perilymphatic fibrosis destroys the affected lymphatics, leaving only fibrous cords to represent the original vessels, and as soon as lymphatic fibrosis has extended slightly down the arm the direct lymphatic outlet of the whole limb is blocked, and the lymph can only return by percolating through the tissue interspaces.

To prevent the brawny arm of breast cancer Handley has devised an operation called "lymphangioplasty." To provide a new set of lymph vessels to replace those destroyed, he introduces into the subcutaneous tissues a number of silk threads, which extend upward from the wrist and terminate in the loose areolar tissue over the scapula.

¹ British Medical Journal, March 6, 1909, p. 582.

In the case in which this operation was performed, the excess of fluid was rapidly drained away from the arm by capillary attraction, and the edema subsided in a few days, although the condition was of nearly three years' standing. The pain was completely relieved. This operation Handley hopes will be applicable to other forms of pachyderma, as well as to elephantiasis and septic lymphangitis.

The natural local cure of cancer is brought about by fibrotic processes, which cut off the cancerous epithelium from that contact with connective tissue cells necessary to maintain its vitality. This process presents some analogy with the natural cure of tuberculosis, which also takes place by fibrosis. Handley, therefore, suggests that the measures which have proved successful in the latter disease may have some benefit in certain of the cases of chronic inoperable carcinoma, but does not, of course, offer it as a substitute for operation.

TUMORS OF THE MALE BREAST. Malignant tumors occur in the male breast about one-fiftieth as often as in the female breast, and are hence not extremely rare. Non-malignant neoplasms, however, occur much less frequently. Woodyatt,¹ in investigating the frequency of benign growths, was hampered a good deal by the confusion that still prevails in the minds of some as to the proper nomenclature for these fibro-epithelial tumors. Thus, the terms adenofibroma, gynecomastia, adolescent tumor, mastitis, are used by different writers for similar conditions.

In his study of 7 benign tumors of the male breast, of which 6 were adenofibromas, Woodyatt proposes the following classification: (1) Sharply circumscribed, firm, dense tumors, which arise without traumatism in the breasts of young men, run a painful clinical course, and show under the microscope little or no evidence of inflammation, but all the characteristics of ordinary adenofibromas, such as may occur in the breasts of young women, and to which they are regarded as analogous. (2) Diffuse or ill-defined growths which may occur at any age as a result of traumatism. Microscopically these enlargements have virtually the same structure as those of Group 1. Signs of inflammation are more in evidence, however, so that their differentiation from chronic inflammation may not be easy. They are termed adenofibromas because of their progressive growth and microscopic structure. This group corresponds to the "traumatic indurations" of some writers.

What the relationship is between adolescent mastitis, so-called, and adenofibroma cannot be settled until histological examinations of the tissue in the former disease have been made. Certainly a close relationship exists between adolescent mastitis and tumors such as are included in Group 1. Probably adolescent mastitis is a separate affection, as a sequel to which adenofibroma may develop in exceptional instances.

¹ American Journal of the Medical Sciences, August, 1909, p. 244.

Nearly all cases of sharply circumscribed adenofibromas of the male breast heretofore described have developed in young boys in the course of what appeared to be an "adolescent mastitis." The histological structure of gynecomastia is simply that of an hypertrophy, which confirms the few existing reports on the histology of genuine unmixed examples of this rare condition. The term gynecomastia might well be dropped in favor of hypertrophy.

While benign tumors of the male breast are in themselves a surgical rarity, the conditions found in Denenholz's¹ case are practically unique. The patient, aged fifteen years, in January first noticed a swelling of the left breast after having played a game of baseball. On examination it was found to be hard, circumscribed, lobular, directly beneath the nipple, about two and one-half inches in diameter, freely movable over the pectoral fascia, but slightly adherent to the nipple. There was no tenderness, no dilated veins, and no secretion on pressure; the axillary lymph nodes were enlarged, but not painful. The right breast at that time was normal. The tumor was removed and found to be an adenofibroma. In May of the same year a growth was noticed in the opposite breast, a diffuse soft mass, pressure on which caused some oozing from the nipple; the growth was rapid, the whole breast extremely hard, and the nipple retracted. The breast was amputated, and the pathological diagnosis was fibrocystic sarcoma. There was an increase in the ducts and connective tissue; the ducts were considerably dilated and the glandular epithelium markedly increased. The newly formed acini, however, preserved their gland type, but were quite irregular in outline. The tissue surrounding the acini was very cellular, but did not correspond altogether to the picture of sarcoma.

CARCINOMA OF THE BREAST. Statistics concerning the percentage of cures in cancer of the breast are apt to be misleading unless properly analyzed. Richardson² states that only when the cases are properly grouped and classified can accurate conclusions be drawn from the published end results. All cases at the time of operation should be classified as favorable, unfavorable, or hopeless, and the following cases are cited as examples: A small tumor in the centre of a breast, with but one or two small lymph nodes involved, should be regarded as an early one and especially favorable for permanent cure. A small tumor, even though associated with a number of enlarged axillary lymph nodes, but easily movable, may be regarded as a favorable case. The size of the tumor is no criterion provided it can be removed by an incision far enough removed from the growth to insure a sufficient margin of safety. Whenever the surrounding structures are infiltrated the outlook is unfavorable though not hopeless, as in those cases in which the

¹ New York Medical Journal, September 18, 1909.

² Journal of the American Medical Association, May 15, 1909, p. 1553.

infiltration involves the ribs or intercostal spaces, the axillary vessels, the axillary spaces. In doubtful cases Richardson lays considerable stress upon the influence of heredity, that is to say, in the presence of a tumor with no symptoms suggestive of malignancy a family history of carcinoma should make one suspicious. The prognosis, even under the most radical treatment, depends on the operative findings. The experienced surgeon can usually recognize cases in which the prognosis is unfavorable, cases too in which the operation was most radical and yet one's instinct foretells an unfavorable end result.

The statistics most worth while are those from a single clinic or from a few large clinics. There is very little to be learned from massing a lot of statistics from a heterogeneous group of operators with different ideas, principles, and methods. Generally speaking, it may be said that when there is a mass of conglomerated nodes in the axilla, the surgeon should know that his dissection is probably too late. When a few nodes are found in the axillary fat, and are easily separated, the case belongs to the group in which the prognosis is good, and in which the percentage of cures ranges from 30 to 50. The only possible exception to the rule of universal exploration in breast disease which Richardson will acknowledge are the cases of multiple tumors affecting both breasts, which are unmistakably retention cysts. Another exception is the breast tumor which appears after the removal of a benign growth or a simple cyst; or the appearance in the other breast of a benign tumor resembling one that has been removed from the opposite breast.

When the tumor is evidently inoperable for one reason or another, the question always arises as to what advice should be given the patient. For my part, I never hesitate to advise operation whenever I am reasonably sure that the tumor can be removed without serious risk to life, and that after its removal the patient's condition will be the better for it. The removal of an ulcerating, offensive mass is always a source of satisfaction to the patient, and, no matter what the condition of the tumor, every patient is somewhat encouraged by the thought that something is being done for her relief and perhaps for the prolongation of her life. For the same reason, whenever the conditions admit of it, I am in the habit, after these palliative procedures, to advise the patient to have some *x*-ray treatment two or three times a week.

Dennis¹ feels certain that it is a wise course to operate under any circumstances unless the mediastinal nodes are involved, or unless there is visceral metastasis, or the growth is adherent to the chest wall. And yet astonishing results have been obtained by operation in cases in which recurrence and death were to be expected. Yet these patients have recovered and remained free from the disease for years, and thus demonstrate the error of a too conservative view. Even when the

¹ Journal of the American Medical Association, May 22, 1909.

outlook seemed most unfavorable, as in cases with extensive ulceration, hemorrhage, wide-spread axillary involvement, the final results have been entirely satisfactory.

As to the technique of the operation, Rodman¹ prefers to clear out the axilla first, and for the following reasons: (1) The axilla may be so hopelessly involved as to make an attempt at removal worse than fruitless. Hence the sooner it is known the better. (2) The blood-vessels can be reached and tied at their origin, and this materially lessens both hemorrhage and shock, as the same vessel is not repeatedly cut, as when one works toward the axilla. (3) The axillary space is dissected from above downward instead of from below upward, because it is both easier from a surgical and better from a pathological viewpoint, inasmuch as the dissection is begun below the encroachments of the disease. (4) We avoid largely, if not altogether, the danger of expressing and distributing cancer cells to adjacent tissues if we first manipulate the affected breast and lymph nodes. (5) A dissection *en masse* is sometimes made impossible if the work is begun at the sternum, as the heavy mass may pull on and break the axillary tail. (6) The functional use of the arm will be better, for the reason that if beginning at the axilla greater precision is assured. The incision should not extend beyond the anterior fold of the axilla, as the resulting cicatrix may interfere with the freest movement of the arm.

Empyemata. Although the surgical treatment of empyemata is as old as the hills, there is still a great deal of dissatisfaction as to results and disagreement as to methods. The old-fashioned method of thoracotomy and drainage often leaves a trail of unacceptable, if not serious, sequels—long-standing suppuration, secondary collections, persistent fistulæ, implantations of tuberculous infections, and crippling deformities. Unquestionably one sees fewer cases of chronic empyema than in years gone by, chiefly, I believe, because of an earlier resort to operation before the visceral pleura is so splinted with a well-organized inflammatory exudate that it cannot expand. There are plenty of operations designed to meet the condition in the chronic cases, notably those of Schede and Delorme, the latter more written about than practised. But what we need mostly is a simple efficacious method which will be successful in the management of the incipient cases, and thus eliminate, so far as we are able, those of the chronic type. Apart from evacuation and drainage, we have been told by Murphy that most cases may be cured by the injection of 60 c.c. of a 2 per cent. solution of formaldehyde in glycerin. By others, again, that vaccine therapy should be used. The latter, practised chiefly by English physicians, has in numerous instances been followed by favorable results. Thus, in Pearson's² case, a colon infection, but little relief followed

¹ Journal of the American Medical Association, May 22, 1909.

² British Medical Journal, July 10, 1909.

drainage and the use of antistreptococcic serum, but after 25 c.c. of anticoli serum had been given by mouth on three separate occasions the discharge became less profuse and not nearly so offensive, and the bacilli less active and greatly reduced in number. White and Eyre,¹ in the treatment of empyema caused by the colon bacillus, have reported remarkable results following the use of vaccines. Pearson prefers the antitoxin because it is quite as efficacious and more readily obtained.

Coming to other observers, we find that Friedrich² recommends in every case immediate drainage according to the Thiersch method. A large fenestrated Nélaton catheter is passed through the sheath of the trocar, a rubber membrane with a small orifice is slipped over it and tied firmly to the tube at the point of emergence. This provides an airtight closure of the thoracic cavity. The catheter is then introduced into a soft-walled drainage tube, which collapses on inspiration and thus prevents the entrance of air and a secondary pneumothorax without interfering with the escape of the exudate. Practically all the metapneumonic cases treated in this way undergo resolution without resort to operation. In all recent non-circumscribed exudates Friedrich regards drainage by resection as contra-indicated and unnecessary. He resorts to operation only in the encapsulated cases, and then only after drainage by the Thiersch method has failed.

The danger in long-standing cases of secondary tuberculous infection of the affected region is well known. That tuberculosis was as common as Lord³ would have us believe is a matter of surprise. Is it true, as he says, that at least three-fourths of the primary pleurisies with effusion are tuberculous? According to him, the failure of other observers to prove the presence of tuberculosis in as large a proportion undoubtedly is due to the use of too small an amount of material in the inoculation experiments. He even goes farther and says that out of every ten cases of primary fibrinous or serofibrinous pleurisy, at least three or four develop pulmonary or tuberculosis elsewhere within an average period of from four to six years. If these observations prove not to be an exceptional experience, we should enforce whenever possible proper hygienic conditions in all our convalescent cases. For the chronic cases where the lung cannot expand Goldman⁴ proposes an operation modified after the decortication method of Delorme. He first resects after the manner of Schede; after the thickened pleura is removed the lung is drawn up to the level and sutured to the skin. The surface of the lung now exposed is completely covered by properly fashioned skin flaps. When the elasticity of the lungs has been lost,

¹ *Lancet*, June 5, 1909.

² *Journal of the American Medical Association*, December 11, 1909.

³ *Boston Medical and Surgical Journal*, April 15, 1909.

⁴ *Zentralblatt f. Chirurgie*, No. 22, 1909.

as in cases of emphysema, he finds that suturing the lung to the skin flap facilitates the expansion of the lung. This is the distinguishing feature between his operation and simple decortication. For the residual fistulæ there is no question as to the remarkable results obtained by the use of Beck's paste. Probably there is not a surgeon in the country who has not had some favorable experiences with this treatment, and especially in those cases in which formerly the method of Estlander and Schede was resorted to reluctantly. In Ochsner's series of 14 cases¹ the improvement of the general condition of the patient following the injections was a very striking feature. The pulse and temperature became normal within a few days, the nutrition improved, the anemia disappeared rapidly, and the discharge from the sinuses usually became sterile in a short time. Of the 14 cases, 3 had been operated upon twice, and 1 three times before the injections were given. All but 2, which are still under treatment, have been cured, and these 2 are making satisfactory progress. While others have been less fortunate, Ochsner saw no evidence of bismuth poisoning. Should such symptoms arise, hot olive oil, at 110° F., should immediately be injected; this dissolves the paste and facilitates its escape through the outer fistula or through a rapidly inserted drainage tube. He makes his injection with an ordinary glass syringe, just enough force being employed to fill the sinus or cavity, but not enough to cause forcible distention. The outer opening is carefully plugged with sterile gauze.

Thoracic Surgery. Surgical intervention on the affections of the lungs may be classed under four different headings:

1. Intrapulmonary interference with diseased foci.
2. Influencing of pulmonary affections by way of the pleura through compression of the lung.
3. Operative procedures on the thoracic wall, for the mechanical influencing of the pulmonary function, thereby reacting on pathological processes in the lung.
4. Operative treatment of the diseases of the thoracic wall itself, in as far as this leads to the exposure of the lungs.

(a) Simple intercostal incision is almost invariably the procedure of election for penetrating into the lung.

Friedrich² illustrates a modification of Mikulicz's powerful rib-spreader, for use in conjunction with this incision. With the lung open to inspection, and with the pneumothorax under the control of the differential pressure method, the organ may be very completely palpated in all its parts; further, by causing variations of pressure, the lung may be stretched or relaxed, facilitating work upon wounds of the organ, and also by changing the intra-pulmonary circulation, differences in color between healthy and diseased tissue areas can be brought out.

¹ *Annals of Surgery*, July, 1909.

² *Journal of the American Medical Association*, 1909, liii, No. 24.

The danger of pneumothorax can be lessened by its gradual development, so that the affected lung segments can be drawn out with tamponade of the remaining pleural space. Infection represents the most serious danger of intrathoracic operations, and the danger of infection is certainly increased by a pneumothorax (Dollinger), through revolutionizing of the lymphatic circulation of the pleuræ; the presence of pneumothorax or the closure of a wound before the pneumothorax is entirely removed increases the danger of infection.

The intercostal incision is ordinarily sufficient for even extensive foci of disease or injury; the removal of an extensive portion of the neighboring rib is reserved for gangrene or abscess. In injuries of the lung, the wound is closed by direct suture, if possible, perhaps after trimming the edges. Friedrich recommends either an inverted suture, or the penetrating suture, using silk as the suture material. The wound of the thorax is sutured. In abscess and gangrene, the diseased focus is sutured to the thoracic wall, and opened at the same time or later. The discovery of small wounds and the source of hemorrhage is greatly facilitated by the differential pressure method.

In regard to tumors of the lung, our clinical experience is far too small to permit of outlining a general technique. We know from clinical experience, and from animal experimentation, that large segments of a lobe, or even entire lobes, may be removed. The diseased segment is clamped off and excised well into healthy tissue, under the customary measures of hemostasis, partly by direct ligature, partly by acupuncture. It is astonishing how easily hemostasis in the lung can be obtained. The technical problem is rather the closure of the bronchus in a given case; if the bronchus be devoid of cartilage, the mucous membrane is dissected off and closure accomplished by direct ligature. But as soon as the cartilaginous area is reached, our technique is unreliable, and it is not yet decided how often the opening of such a bronchus will necessitate a partially open method of treatment. The pulmonary wound is reduced as much as possible by suture, and the bronchial lumen is left open to the outside at first, by fixing the lung to the chest wall. Friedrich has previously shown, in 1907, the point in the bronchi where an amputation must stop, on account of the impossibility of bronchial closure, and the danger to the pulmonary plexuses of the vagus nerve. This region marks the limit of operability. Lenhartz follows a two-stage operation, first firmly ligating the lobe at its base by an elastic ligature, and ten days later ablation of the ligated segment. All prolonged operations on the lungs must be performed under the most careful covering of the entire wound with tampons and compresses. Friedrich points out the significance of the x-ray in diagnosis in this branch of surgery. The advisability of operating in two stages for abscess, gangrene, and lung tumors is still an open question.

(b) Compression of the lung, and the treatment of empyema.

The compression of the lung by the introduction of air or nitrogen has, in a large number of cases, proved of value, the collapse of lung tissue being followed by subsidence of the sputum and the fever, improvement in the general condition and in the physical findings. The manual breaking up of adhesions through an intercostal incision may prove an easy matter, or it may be attended with serious danger. Friedrich is of the opinion that this procedure will prove successful only in very exceptional cases. Pleural empyema is treated in Friedrich's clinic, as follows: puncture with a large trocar or a small incision, followed by immediate drainage according to the method of Thiersch. This consists in passing a fenestrated Nélaton catheter through the sheath of the trocar; a rubber sheet with a small opening is slipped over the catheter and tied fast where the tube emerges, thus providing an air-tight closure of the thoracic cavity. The catheter is continued into a soft-walled drainage tube, which acts like a vein, permitting the escape of fluid under the increased intrathoracic pressure, but preventing the entrance of air because of the coaptation of its walls in inspiration; a reliable mechanism is thus obtained, which effectively permits drainage and prevents pneumothorax. Many empyemas, practically all the metapneumonic cases, are completely healed by this apparatus. Resection may be done later after the focus has become encapsulated. Resection is not indicated in recent cases.

(c) Operations on the thoracic wall for the treatment of tuberculosis give in the majority of cases an essential improvement, as seen in increase of weight and subsidence of cough, sputum and fever. The first cases were over eighteen months ago, and confirm the belief that the operation of thoracoplasty gives the above-mentioned favorable results, provided the operation be done in only carefully selected cases; only those are operable who have unilateral cavernous lesions, with at most passive foci on the opposite side; they must be free from evident recent tuberculous processes in other regions of the body, particularly the bowel. Friedrich feels encouraged to extend his operation of ossification of the chest wall with or without removal of the first rib, to cases of slowly infiltrating non-cavernous phthisis.

In the treatment of pulmonary emphysema, Friedrich resects pieces of 4.5 to 6 cm. in length at the cartilage bone boundary of the second to sixth rib, with careful ablation of the retrocostal periosteum. The resections must be extensive enough, and the ablation of the retrocostal periosteum be thorough enough to insure an improved mobility of the chest wall. These cases must be strictly restricted to pure primary alveolar emphysema.

(d) Tumors of the chest wall constitute a field in which Friedrich believes the differential pressure method will reach its first generally conceded triumphs. In the surgery of the heart an essential advance is seen in the recognition of the cardiac injury, after the rapid control of the

pneumothorax through the differential pressure method. Sauerbruch and Häcker, in Friedrich's clinic, have shown that the fall of the minimum pressure to zero causes an increase in the bloodpressure in the body, retards the heart-beat, and augments the individual waves. Thus, the differential pressure method provides the means for influencing the sequence of the beats and the filling of the heart. The hemorrhage from a wound of the heart is always systolic, becoming diastolic also only in cases of large wounds and wounds of the auricles. The hemorrhage from a heart wound diminishes in proportion as the lungs are allowed to collapse. The pneumothorax thus becomes the regulator of the hemorrhage, and is allowed to persist until the suture of the heart is completed. The pneumothorax is then removed and the pericardium and the pleura sutured.

The choice of the incision for exposing the heart is determined by the possibility of free inspection. Friedrich has devised a transverse incision of the sternum, this incision extending into the tissue at either side of the sternum, as a method of exposing the anterior mediastinum without sacrificing portions of the sternum or ribs. This method has been tried with success.

All the recent experiences of cardiac and mediastinal surgery lead Friedrich to a very optimistic view of this field of surgery, operative treatment of stenoses of the mitral and aortic valves being within the realm of the possible. He thinks, on the other hand, that the surgery of the lower end of the esophagus is not particularly hopeful. The achievement of half-way permanent results, in spite of much earnest endeavor, still remains a desideratum.

Pneumectomy with the Aid of Differential Air Pressure, an Experimental Study. The success of the operation for total extirpation of the lung depends on the operator's ability to close the divided bronchus air-tight. Various methods have been employed for this purpose, as follows:

1. One mass silk ligature around the bronchus and its vessels; amputation; cauterization of the mucosa of the stump with pure phenol or the Paquelin cautery.

2. Elastic mass ligature around hilus; removal of lobe at second sitting (Lenhartz).

3. Ligature and division of main bronchus; remnant of lung tissue stitched over stump (Garré).

4. Isolation and temporary clamping of bronchus; curetting of the mucous membrane of the divided bronchus; tight silk ligature; second loose catgut ligature more centrally around bronchus (Friedrich). To these methods Willy Meyer¹ has added a fifth, which is illustrated step by step in the first part of this paper. It consists, in short, of applying to the bronchus the methods now most generally used in the treatment of the stump of the appendix, crushing and ligating the crushed stump

¹ Journal of the American Medical Association, 1909, liii, No. 24.

of the bronchus; the stump is then buried by pushing it back into the lumen of the bronchus and held in place by suture of the edges of the inversion.

This method resulted in obtaining 22 recoveries (84.6 per cent.) of the total of 26 cases of total excision of one lung (21 cases) and of partial excision of one lung (5 cases).

The thorax is closed full of air. With advancing cicatrization, this air is absorbed, the heart with the opposite lung is gradually pulled to the other side, the diaphragm rises and the thorax flattens somewhat. The cavity is thus gradually filled up. This process takes several weeks, if not months. It is astonishing how well dogs stand the entire removal of the lung on one side. It is a reasonably safe procedure in dogs and so effective that its trial on human beings appears justified in cases in which the excision of the lung is indicated.

The second part of Meyer's paper describes in detail an apparatus which he has devised for intrathoracic surgery. It differs from any chambers hitherto devised in its combination of two rooms, which enable the operator to choose between several combinations of air pressure: 1. The pressures in both chambers (one for the head of the patient, the other for the body, with ample room in each compartment) deviate in the same direction from open air:

- (a) Inner positive chamber, combined with outer positive chamber.
- (b) Inner negative chamber combined with outer negative chamber.

2. The pressures in both chambers deviate in opposite directions from open air:

- (c) Inner positive chamber combined with outer negative chamber.
- (d) Inner negative chamber combined with outer positive chamber.

The combination 2, c, is the one which Meyer has had constructed, a combination which permits of performing an operation under all of the following conditions:

1. Under positive differential pressure.
2. Under negative differential pressure.
3. Under part positive, part negative differential pressure.
4. Under a gradual change from positive to negative differential pressure, and vice versa.
5. Under a repeated change from positive to negative differential pressure, and vice versa.
6. Under negative differential pressure at an altitude above sea level higher than that of the place where the operation is performed.
7. Under negative differential pressure same as 6, but at gradually or repeatedly changing altitudes.

Positive and Negative Pressure. The paper by Robinson and Leland¹ represents the results of a large amount of work evidently intended to

¹ *Surgery, Gynecology, and Obstetrics*, March, 1909.

decide the question of the relative values of the two methods of obtaining pressure difference—the cumbersome and expensive, non-transportable negative pressure cabinet, and the comparatively simple, easily transportable devices for maintaining positive pressure. The first part of the paper deals with this subject and with the description of an apparatus for positive pressure which has been elaborated in the course of the experiments. The conclusions as drawn by the authors clearly express their ideas.

“1. The positive-pressure method as proved by experiments has no more pathological effect on the circulatory and respiratory functions than negative pressure.

“2. The clinical operative results under positive pressure have justified its employment.

“3. It possesses many advantages over the negative-pressure method.

“4. Air compression should be excessive rather than insufficient, and is most conveniently supplied directly from a small rotary air pump.

“5. The anesthetizing segment should consist of an ether bottle with side-tracking connections, and permanent joints arranged in the simplest possible manner. (Rectal anesthesia, when employed, discards this portion of the apparatus.)

“6. A positive-pressure apparatus should be supplied with a face mask which in accidental pleural punctures, with subsequent dyspnea, will amply suffice for emergency use. In most thoracic operations it could be removed in case of vomiting without danger.

“7. For extensive resections of the chest wall in the absence of adhesions, when the permanence of air compression is essential, personal intubation would eventually become the method of choice. A tube for the human has not yet been perfected.

“8. For animal experimentation, masking and intubation are unquestionably the methods of choice.

“9. The water bottle is the preferred device for resistance, because always available and regulated with ease.

“10. All forms of rhythmical artificial respiratory devices are too elaborate for universal surgical appliance.

“11. Affluent air of sufficient volume and pressure, with low resistance, to support the normal respiratory movements, by providing air exchange and preventing collapse, is the fundamental principle of positive pressure.”

The second part of the paper describes in detail eighteen operations upon rabbits, performed with the object of gaining information in regard to two questions—in removing greater or less portions of the lung, how large a cavity can be emptied with reasonable hope that the remaining thoracic organs of both sides will compensatorily obliterate this space. Furthermore, if a cavity is left empty, is a thoracoplastic operation on the chest wall essential for its complete obliteration?

Operations on dogs have led the authors to conclude that the emptying of one side of the thorax in the dog is attended with almost no hope of recovery. They therefore used rabbits, the results leading to the following conclusions:

“Throughout the above experiments it is evident that positive pressure was not a *sine qua non* for preservation of life in the rabbit during the opening of one pleural cavity. In the dog, on the other hand, the same procedure in the absence of pressure leads at once to a fatal ending. Certain human individuals may, therefore, be compared to the rabbit in their resistance to pneumothorax; certain others, furthermore, resemble the dog.

“Another distinct difference in the above animals is to be noted as regards the susceptibility of the remaining thoracic organs to displacement for occupation of the emptied half of the thorax. Cases of total pneumectomy in the dog followed by such displacement and recovery have been rarely reported. The above experiments in rabbits, however, show that this compensation is far more to be expected after such operations. In the human, moreover, there is perhaps no more unpromising factor than the disposal of a persistent cavity in the thorax. Such postoperative spaces are prone to pleuritic effusion, which in its turn lessens the possibility of compensatory displacements, and it may be said that the tendency of the operators is to perform such plastic operations on the chest wall as to obliterate such cavities as soon as possible.

“I am yet unable to do more than theorize as to this variation in resistance to operative and postoperative pneumothorax.”

Surgical Treatment of Pulmonary Tuberculosis. To what extent is pulmonary tuberculosis a surgical lesion is a question now frequently asked but rarely answered. Just as in many other thoracic conditions, the surgical measures for their relief are still in the formative stage. However, it is our duty to record each year such contributions as are made by competent men, and the reader must judge for himself as to their respective merits. While in a measure successful in certain cases, the use of artificial pneumothorax in the treatment of phthisis is not without its danger. Among these, according to Dumarest,¹ is subcutaneous emphysema, which may occur either during the insufflation or later when the nitrogen gas escapes through the orifice made by the needle. Another, and one more difficult to avoid, is the reflex nervous disorder designated “pleural eclampsia.” The symptoms of this condition are alarming; the face becomes congested, the pulse weak and rapid, breathing labored, but consciousness is not lost.

Artificial pneumothorax has been used successfully by Wenckebach²

¹ International Clinics, vol. ii, ser. 19, p. 153.

² Mitt. aus den Grenz. Med. und Chir., vol. xix, No. 5.

in cases of tuberculous empyema of long standing. He aspirates the pus, and then through the same tube permits air to enter the pleural sac. With the inception of the pneumothorax the relief is almost instantaneous. Atmospheric air acts as well as oxygen or other gases. The injections should be repeated at intervals of three to six weeks. When the air is absorbed a vacuum results, the lung is drawn out by negative pressure, and the cavity is obliterated. Artificial pneumothorax may be useful in cases of chronic serous pleurisy and in chronic non-tuberculous empyemata. There are certain cases, as in the presence of adhesions, where an artificial pneumothorax is of no value. Under these circumstances Friedrich recommends, total thoracoplastic pleuro-pneumolysis.¹ Since then the same observer has introduced a procedure which is applicable only to apical tuberculosis. For these he recommends either detachment of the apex alone or together with resection of the first rib. The immediate results are usually impressive; defervescence follows rapidly, even when the fever has been high; and the amount of sputum is often reduced from several hundred c.c. to practically nil in a few weeks at most, and the cough soon disappears. In all cases he noted an increase of body weight and an improvement in the patient's general condition. As suitable for this operation he includes cases not over forty years of age, those whose nutrition has been well sustained and those without tuberculous lesions in other organs.

Freeman² looks with disfavor upon Friedrich's operation because of the risks which he believes are great in advanced cases of tuberculosis, and it is in these that the method is particularly indicated. Freeman advocates resection of a portion of two or three ribs near the apex under local anesthesia and the application of external pressure in such a way as to obliterate the cavity and favor healing by fibrous contraction. The procedure should not be applied indiscriminately, but should be reserved for the refractory cases with marked and limited apical lesions, especially when there is a tendency toward cavity formation. It might be useful also in conjunction with an artificial pneumothorax, when there is reason to believe that the trouble in the apex is of such a character that it will be but little influenced by collapse of the remainder of the lung. In Freeman's operation two or three inches are removed from the second, third, and possibly fourth ribs, and if it seems advisable, the cartilage of the first rib is divided. When the wound has healed, a pad of gauze is placed over the part and an ordinary truss adjusted so as to make considerable pressure. The pad of the truss rests in front and the spring passes over the shoulder to the back. The chest wall caves in and leaves a saucer-like cavity, in spite

¹ *Annals of Surgery*, July, 1909; see *PROGRESSIVE MEDICINE*, March, 1909.

² *Annals of Surgery*, July, 1909.

of the fact that the periosteum of the ribs has not been removed; in fact, the preservation of the periosteum may be of some service, in that in the event of bone regeneration the chest wall cannot expand. While Freeman is enthusiastic as to the future of this operation, his experience has been limited to two cases, in both of which, however, the results were encouraging.

Artificial Respiration in the Treatment of Edema of the Lungs. In the course of a series of experiments on the circulation, Emerson¹ has noted the result of artificial respiration on an animal apparently dying from acute pulmonary edema. It is important to bear in mind that rhythmical variation of pressure, applied at any point of the circulation, seems to assist in the onward movement of the blood, and will in proportion to its extent assist the heart action. If edema is produced experimentally, respiratory movements become exaggerated, feeble, and spasmodic until the animal dies of asphyxia, due to a flooding of the air spaces by blood serum. If, when asphyxia begins, with the veins distended, cardiac insufficiency established, and moist rales heard over the lung, we apply artificial respiration through a tracheotomy tube, gently distending the lungs and allowing them to collapse, with or without suction, we find presently an amelioration in the animal's condition. The full expansion of the lungs forces a considerable amount of blood onward to the left auricle, the pulmonary vessels are emptied, and the resistance against which the right ventricle has been working is lowered. Under what circumstances may this treatment be applied to the human subject? With a heart just able to maintain its competence, insufficiency is easily precipitated and pulmonary edema likely to follow. Under such conditions Emerson believes the present mode of treatment would be materially aided if artificial respiratory movements were used. This assistance may prove more prompt and effective than medication, and would, at least, give mechanical relief to the overloaded heart muscle. The treatment would be indicated whenever the edema and cardiac incompetence are of sudden development and are due to causes which are likely to prove of brief duration. When the edema is due to cardiac failure, as in the course of a pneumonia, or appears as the terminal feature of a chronic endocarditis, artificial respiration would be of little avail.

Wounds of the Lung. Among the indications for the use of positive or negative pressure apparatus should be included wounds of the lung. There are two forms of pneumothorax accompanying these injuries; in the one developing from superficial wounds of the lung only a small amount of air can escape before the alveoli and bronchioles become filled with blood, thus preventing further escape of air. This form of pneumothorax is harmless, as the air is rapidly absorbed. When

¹ Archives of International Medicine, 1909, vol. iii, p. 368.

a large bronchial tube is ruptured the symptoms are more alarming; air enters the pleural cavity with each inspiration, the lung is totally collapsed, and the acute pneumothorax affects indirectly the heart, mediastinum, and sound lung. In this type the air cannot escape during expiration because the lacerated lung tissue forms a valve over the torn bronchus, or, the glottis being closed reflexly, increased pressure in the bronchus will again force the air into the pleural cavity. As the air accumulates under increasing tension it begins to find its way into the cellular spaces of the mediastinum, and finally to the tissues of the neck. The development of emphysema in the neck is almost always an evidence of a severe injury, as it implies that the mediastinum is also involved; on the other hand, cellular emphysema of the chest wall results from injuries which have a direct communication with the torn lung, and is not as dangerous. For the serious type Sauerbruch¹ recommends immediate removal of the air from the tissues and pleuræ by the negative pressure apparatus; he thinks it particularly applicable in these cases. The torn lung and bronchus can be readily found and sutured, and at the same time all bleeding arrested.

The treatment of stab or bullet wounds of the lung has in the past been very conservative. Of recent years, however, there seems to be a growing tendency on the part of many to resort to exploration in almost every case, just as one would advise an exploratory operation in gunshot wounds of the abdomen. While, no doubt, there are certain instances where exploration is clearly indicated, especially in cases of serious hemorrhage and pneumothorax, I feel quite convinced that reasonable conservatism in the management of these cases would be followed by a lower mortality than if one resorted to exploration as frequently as one would in similar injuries to the abdomen. Every surgeon of experience has had under his care cases of both stab and gunshot wounds of the chest which have not only recovered but which have recovered without complications or sequelæ. However, it is interesting to follow the clinics of those who may take a more radical view of this.

Stuckey² reports a large series of cases, subjected to operation, in which a mortality of 31.2 per cent. resulted as compared with 38 per cent. of deaths by conservative measures (Garré). His operations were performed without the aid of differential pressure, the use of which would, he believes, have decreased to a considerable extent his number of fatalities. Borchardt³ advocates a radical exposure of the operative field; otherwise the lung will be torn in searching for the wound. While believing thoroughly in operating under differential pressure, he does

¹ *Beit. z. klin. Chir.*, Band IX, p. 450.

² *Arch. f. klin. Chir.*, Band lxxxviii, p. 767.

³ *Berliner klin. Woch.*, April 5, 1909.

not hesitate to open the pleural cavity even when appropriate apparatus is not available; he prefers immediate closure of the pleural cavity to drainage, and does not approve of suturing the lung to the parietal pleura as an aid to reëxpansion.

Lotsch¹ advocates early operative interference especially, if positive or negative pressure can be employed. In two cases in which positive pressure was used with Brauer's apparatus, the site of puncture was readily found when the ribs were resected, and, though empyema developed in each, both cases recovered. To prevent collapse of the lung another ingenious suggestion has been made by Teske,² which, if effectual, would at least have the advantage over the various positive and negative pressure apparatuses of being inexpensive and more generally available. When an animal was placed in a tub of warm water under general anesthesia and a large opening made in the thorax, the respiration was regular, and while the volume of inspired air was not quite as great on the affected side, there was no other material difference. When the animal was taken out of the water the breathing was unaltered, for sufficient water remained in the pleural cavity to float the lung and prevent collapse. The method seems particularly applicable in the treatment of wounds of the heart, and lung wounds where freedom from shock and economy in time are so essential. By this method the shock due to collapse of the lung is avoided, and considerable time is saved in performance of the operation. Furthermore, the presence and actual contact of the warm salt solution is an advantage in itself, especially as in many cases the patient has already lost a considerable amount of blood. At the completion of the operation the lung was sutured to the chest wall and the fluid removed.

Actinomycosis of the Lung. Actinomycosis of the lung and pleura is uncommon in America, though frequent in Europe. In the majority of cases the portal of entrance is the respiratory tract; at other times, carious teeth, or the digestive tract. Recently Opokin³ has called our attention to the skin as the avenue by which the fungus gains entrance. The diagnosis is difficult, because there are comparatively few characteristic symptoms. Pain is generally localized to the affected side, is apt to appear suddenly, and is very obstinate and persistent. In early cases a persistent cough is suggestive, but one will not find any physical signs until a fairly large area becomes involved. The radiogram may reveal shadows corresponding to the areas of induration. The most efficient remedy in the treatment of actinomycosis here or elsewhere is the iodides; but to get the best results they must be given in full doses, *i. e.*, 2 to 6 grams per day. The propriety of surgical intervention is questionable; if surgery is to be resorted to, we should

¹ Münch. med. Woch., January 19, 1909.

² Zentralblatt f. Chir., No. 6, 1909.

³ Arch. f. klin. Chir., September 2, Band lxxxviii, p. 460.

not wait until metastasis has occurred; when the lesion is exposed it is removed with curette or cautery.

Wounds of the Pulmonary Vein. With Trendelenburg's operation for pulmonary embolism fresh in our minds, Eiselsberg's case¹ of suture of the pulmonary vein for closure of a stab wound is especially interesting.² Eiselsberg's patient, a man, aged fifty-four years, a morphine habitué with a self-inflicted wound in the cardiac region, was taken to the clinic pulseless and in a state of collapse. Although his condition seemed hopeless, he was placed in the negative pressure chamber, the injured region was exposed, and a wound found at the base of the pulmonary vein. This was closed with several silk sutures, and by the time the wound in the chest was closed the radial pulse had returned. Up to the last step the operation was performed without an anesthetic. The postoperative course was complicated by a pleural effusion on the left side, which persisted in spite of repeated aspiration. This eventually proved fatal fifty-four days after the operation. It is more than likely that with the average resistance the patient would have survived the operation, as the postmortem examination showed that the pleural infection had almost subsided. Eiselsberg was particularly struck with the ease of the operation as performed under negative pressure.

Pneumothorax and Posture. Little or no attention has been given to the influence of posture on pneumothorax. Eiselsberg's³ contribution, though entirely experimental, is quite original, and may prove to have some practical bearing, although one should always remember, in endeavoring to draw an analogy between the dog and the human in matters pertaining to the thorax, that the anatomy of the dog differs in some very important particulars from that of man. In studying the effect of large and small openings, he found that when the size of the openings approached to or exceeded that of the diameter of the animal's trachea, dyspnea and death followed. During the observations the posture of the animal was frequently changed; whenever the animal was on its back, whether the opening into the chest were small or large, the symptoms of pneumothorax always developed. With the animal on its belly and a small opening into its pleural cavity, it continued to breathe quietly and naturally. Even with a very large opening (2 to 6 cm. in diameter), breathing was regular and quiet. If symptoms of pneumothorax developed with the animal on its back, if it was turned on its belly breathing became regular and quiet again. Further experiments seemed to justify the conclusion that the influence

¹ Zentralblatt f. Chir., 1909, No. 31.

² See review of Trendelenburg's article in PROGRESSIVE MEDICINE, March, 1909, on "The Surgical Treatment of Pulmonary Embolism," in which the operations of Siever and Trendelenburg were recorded. Both cases terminated fatally, the former's fifteen hours and the latter's thirty-seven hours after the operation.

³ Journal of Experimental Medicine, May 1, 1909.

of posture on the heart was an important factor in the difference between the symptoms produced in the prone and supine positions.

Pulmonary Embolism. The cause of this postoperative complication is a problem yet unsolved. It has been attributed to a phlebitis or thrombosis in some portion of the venous system at a distance from the operative field, for example, in the deep pelvic veins or femoral vein, but, as Gibson says,¹ this only shifts the responsibility to postoperative phlebitis, about which just as little is known. It has been claimed that confinement in bed promotes coagulation and clot formation, but while enforced inactivity may predispose to thrombosis in elderly people, in those with cardiovascular and chronic pulmonary lesions, and in the cachectic and subjects of dyscrasias, Gibson thinks it ridiculous to assign such a cause to healthy and relatively young subjects. No doubt, infection in some form must play an important role, and in many instances the toxic products may arise in the gastrointestinal tract as the result of postoperative paralysis.

When we examine into the time at which pulmonary embolism develops, we find that 60 per cent. occurs in the first week after operation, 29 per cent. in the second week, all others up to three months, 16 per cent. There are more deaths in the first and second twenty-four hours after operation than on any other days, and yet in some cases the patients have been up and about for days or even weeks when the fatal accident occurred. If so many cases occur early, it is obvious that phlebitis cannot often be a factor, as this is not encountered until a later period. Are there any prophylactic remedies? Certainly patients cannot be permitted to get up any sooner after operation. It has been suggested that patients be encouraged not to lie in the same position, as this may favor thrombosis, and Lenormant² recommends the use of heart stimulants, especially in patients whose heart action is weak, and saline infusion when the tension is low or the patient anemic from hemorrhage. The value and application of Trendelenburg's operation for the removal of pulmonary emboli has already been referred to. By some the propriety of the operation is questioned, while others, admitting it has a limited field of usefulness, look upon it rather as an ingenious bit of thoracic surgery. According to Busch, the operation should be performed only when other methods fail to relieve the alarming and urgent symptoms. When the primary lesion is of a septic nature, when there is advanced arteriosclerosis or cachexia, the operation, of course, should not be undertaken. A preliminary dose of morphine should be given to quiet the labored respirations, to be followed immediately by intravenous injections of digitalin.

¹ Medical Record, January 9, 1909.

² Archives Générales de Chir., Paris, March, 1909, No. 3.

³ Deut. med. Woch., 1909, No. 22, p. 1265.

In his case Krüger¹ was able to institute operative procedures within twenty to twenty-five minutes after the first symptoms of pulmonary embolism arose according to Trendelenburg's technique. The patient a woman, aged thirty-three years, had been operated on for hernia. She had had an uneventful convalescence up to the eleventh day, when she passed into a state of collapse during the dressing of the wound. She became pale, the pupils were dilated, the pulse small and weak; after a slight reaction she became cyanotic and dyspneic, and felt as though she were dying. After hurried preparations the thorax was opened; the pulmonary artery felt rather rigid, and the operator thought he was able to feel the embolus. A rubber tube was placed around the sinus transversus pericardii and the artery opened between two pairs of forceps. A thrombus was exposed, and only partially removed when cessation of cardiac action necessitated temporary abandonment of the attempt until the action of the heart was restored by massage. A still larger embolus was removed, when again the patient collapsed. During this step of the operation the patient lost a considerable amount of blood because the rubber tube did not control the bleeding, and the operator had some difficulty in introducing the sutures. For several days the patient experienced distress on breathing; 500 c.c. of fluid were aspirated from the pleural sac on two occasions, and sixteen days after the operation the patient died. The autopsy disclosed a fresh pericarditis, an empyema on the left side, several infarcts in the lung, and small emboli in the branches of the pulmonary artery.

Malignant Tumors of the Thorax. Operations for the removal of malignant tumors of the chest wall have been practised these many years. The results are often unsatisfactory because the tumor is often very much larger than appears on the surface, and one can never tell how much pleura, lung, or diaphragm may be involved. The technical difficulties, therefore, are often great, and one should under no circumstances begin such an operation unless he is prepared to resect portions of pleura or diaphragm if necessary, and for this reason the clinic should be equipped with a pressure apparatus which could be used in such an emergency.

The following brief abstracts of three cases may be of interest: In the first, observed by Menistrina,² the tumor developed at the site of an old fracture. It was dissected free from the soft parts; the sixth to tenth ribs and a portion of the pleura were resected. The pleural wound was closed and the defect in the chest wall repaired with flaps taken from the pectoralis major and latissimus dorsi. The lung expanded promptly and the patient made an uninterrupted recovery. To

¹ Zentralblatt f. Chir., 1909, No. 21, p. 757.

² Medical Fortnightly, May 10, 1909.

prevent recurrence, both Coley's fluid and the *x*-rays were used during the convalescence.

The second case¹ was a sarcoma of the sternum; the tumor extended to the costal cartilages on either side. The sternum from the level of the second intercostal space and about one inch of each of the lower five costal cartilages were resected. The operation was carried out subperiosteally as far as possible, except at one point where the periosteum and part of the left pleura were involved. Five weeks after the operation the bone and cartilage had regenerated sufficiently to restore the costal arch. There was metastasis in the scar and elsewhere. To completely remove the growth in his case, Rockey² found it necessary to include the entire thickness of the chest wall, including about six inches of the eighth, ninth, and tenth ribs, the adjacent pleura, a portion of the diaphragm two inches wide and six inches long, and the adjoining part of the abdominal muscles and the periosteum. In closing the wound the diaphragm was sutured to the chest wall, and before the last inch of the incision was closed, the tube from the oxygen cylinder was introduced into one nostril; the other nostril and mouth were closed by hand. By this means the residual air was driven from the pleural cavity. It was necessary to inflate the lung only for a few moments, and immediately after the operation normal breath sounds were heard over the entire lung and there were no physical signs of pneumothorax. This simple procedure may be of value in other intrathoracic operations when the more complicated apparatuses for differential pressure are not accessible. The operation was facilitated by using rectal anesthesia.

Primary Carcinoma of the Lungs. Primary cancer of the lung originates either in the epithelium of the alveoli or of the bronchi, and when from the latter it may begin from the surface epithelium or in the bronchial mucous glands. The co-existence of carcinoma and tuberculosis in the lung is not uncommon; it often occurs elsewhere, and was found by Wolff twenty-three times in thirty-one carcinomata of the lungs. Cases have been reported as that by Garbat,³ in which the carcinoma developed directly in a tuberculous area. Here not only was there a distinct predisposition to tuberculosis, but there were old tuberculous lesions in the left apex. The possible co-existence of tuberculosis makes the diagnosis difficult in many cases, and may cause a cancerous growth to be overlooked until late in its course. When the apices remain clear, when the lesion in the lung is circumscribed, and when tubercle bacilli are absent from the sputum, the presence of a carcinoma should be suspected. The advanced age of the patient, the presence of a bloody pleural fluid, the persistence of dulness after tapping, and the constant

¹ Isaacs' *American Journal of Surgery*, September, 1909.

² *Annals of Surgery*, March, 1909, p. 383.

³ *American Journal of the Medical Sciences*, June, 1909.

presence of blood in the sputum in the absence of tubercle bacilli taken together warrant a diagnosis of carcinoma of the lung.

Wounds of the Heart. In only a comparatively small percentage of all inflicted heart wounds will surgical aid be required. In the larger wounds the hemorrhage into the pleural cavity or through the external wound usually proves fatal. In smaller wounds the so-called "heart tamponade" is produced, that is to say, the intrapericardial pressure prevents the entrance of blood through the great veins into the auricles, and thus the ventricles are pumped dry. The fatal issue in such cases is due not as one might suppose to loss of blood. The release of this intrapericardial pressure is followed by a corresponding improvement in the action of the heart and the condition of the patient, and it has been suggested, therefore, while preparing for the operation that temporary relief be afforded by preliminary aspiration of the pericardium. As infections have occurred in more than 50 per cent. of all patients who have recovered, and in at least 40 to 50 per cent. of the fatal cases, the preparation of the field of operation seems a matter of some importance. The preliminary cleansing of the skin might be followed by the application of tincture of iodine or Harrington's solution, and as a further precaution the original stab or bullet wound in the soft parts might be excised, as some of the infections undoubtedly originate here.

The various methods of approaching the heart are described by Peck¹ and Vaughan.² As Vaughan states, the method of approach will often be determined by the situation and character of the external wound. Whatever method is adopted, it should be one that will freely expose the heart, not open the pleuræ, and will not leave the chest wall permanently impaired. After the pericardium is freely opened by enlarging the original wound, there may be profuse bleeding to be controlled either by direct pressure or by the rapid introduction of sutures. An intravenous saline infusion given while the operation is in progress has been found to be the most effective stimulant when the function of the heart is altogether arrested; it has been successfully employed in several cases, and should always be given a thorough trial before the case is abandoned.

In studying the postoperative infections, Peck found that 60 per cent. of the patients developed either pericardial or pleural complications. By some it is thought that the use of drainage favors the development of secondary infections, and that in all cases both wounds should be closed without drainage. This view is, however, open to criticism. If the pleura contains much blood and has been widely opened, it would be quite proper to drain the pleural cavity alone, and for this purpose the drainage material should be introduced not through the

¹ *Annals of Surgery*, July, 1909.

² *Journal of the American Medical Association*, February 6, 1909.

operative wound, but through a separate opening made posteriorly. If the lung is collapsed from pneumothorax, aspiration drainage should be employed. The soft parts should be carefully sutured to prevent the sucking in of air through the accidental or intentional pleural wounds.

In previous years it has been my custom to publish an analytical table of the total number of cases I had collected. The following table represents the total number of cases on last year's table plus five additional cases since recorded.

	Cases.	Died.	Recovered.	Mortality. Recovered.	
				Per cent.	Per cent
Right ventricle	48	31	17	64.5	35.5
Left ventricle	61	30	31	49.1	50.9
Right auricle	4	1	3	25.0	75.0
Left auricle	3	1	2	33.3	66.7
Left apex	6	3	3	50.0	50.0
Coronary artery	1	1	0	100.0	
Septum	2	1	1	50.0	50.0
Seat not stated	9	5	4	55.5	44.5

Peck, when he published his article, had collected 160 cases. If to these are added 4 that have appeared since, the following should represent the total number of operations for heart wounds.

	Cases.	Per cent.
Total number	164	
Number of deaths	103	62.7
Number of recoveries	61	37.3

The following is a brief summary of the cases operated upon during the last year:

1. Peck's case was a stab wound of the right auricle; the operation was performed within forty-five minutes of the accident. The pericardium contained a wound 1.5 cm. long so close to the edge of the sternum as to necessitate the removal of a portion of it in order to secure proper exposure. Intrapericardial tension was so great that the heart beat could not be felt even with the finger directly on the sac. Upon opening the pericardium the auricular wound, 1 cm. long and 2 cm. above the auriculoventricular groove, was seen. The wound in the auricle was closed with four sutures of chromic catgut and the pericardium closed without drainage. A slight pleurisy persisted for the first week after the operation, but the wounds healed by first intention and recovery was complete.

2. In Vaughan's¹ case, also a stab wound and operated upon within an hour of the injury, the knife was found to have passed through the left pleura and lung, the pericardium, and into the right ventricle. The wound, one-third of an inch long, was closed with a double row

¹ Loc. cit.

of continuous silk sutures. The pericardium and pleura were closed without drainage. There were no complications.

3. Of Grasmann's¹ two cases, the first, a boy, aged fourteen years, sustained a stab wound of the right ventricle. The wound was closed with silk sutures and without drainage. The patient recovered without any untoward effects.

4. The second patient was admitted to the hospital one-half hour after a knife wound, in a serious condition. The operation, carried out without an anesthetic, disclosed a wound of the right ventricle 3 cm. in length. Cardiac action ceased after the second suture was introduced and could not be revived either by massage or the other methods employed. The autopsy disclosed, in addition to a small wound of the septum, severance of one of the papillary muscles.

5. Flörcken² closed a wound of the right ventricle 2 cm. in length with two catgut sutures. The small pleural defect was then covered with muscle and the entire wound sutured without drainage. The patient completely recovered, convalescence being slightly interrupted by a left-sided pneumothorax and a small pericardial effusion.

Experimental Pericardiectomy. We know that at times the pericardium presents certain anatomical defects. In some instances these may consist in the total absence of the sac; the heart lies between the right and left pleura, so that the left pleura practically covers the left side of the heart and the surface of the right side is in contact with the right pleura. A small portion of the heart remains uncovered. In spite of the presence of so serious a defect, there may be nothing to call attention to it. If the pericardium can be dispensed with, or at least is not a vital necessity, the question arises as to whether in the presence of disease, for example, in certain malignant tumors or in pericarditis, a portion of the pericardial sac may be removed. This is the problem which Parlavecchio³ tried to work out by animal experimentation. He found, among other things, that while extensive excision of the pericardium in dogs was always a serious operation, it was quite compatible with life, and, curiously enough, the more extensive the resection the better was the operation borne. The animals lost in weight rapidly and the left ventricle became hypertrophied. Speaking in a purely speculative vein, Parlavecchio discusses the treatment of those cases of severe chronic pericarditis which do not respond to paracentesis or drainage; if they could be benefited by removal of portions of the sac, what portion of the sac should be excised? He thinks the lateral and anterior wall, in order to avoid extensive cicatricial formation, which would seriously embarrass the action of the heart. The integrity of the left pleura

¹ Munch. med. Wochenschrift, November 17, 1909.

² Ibid., 1909, No. 32, p. 1634.

³ Deut. Zeit. f. Chir., Band xxviii, Heft 2 and 3, p. 126.

in such an operation must be preserved except in cases of total excision for malignant disease, in which case it would seem better to place the heart free in the left pleural cavity than to leave it exposed in the anterior mediastinum to beat against the chest wall. Care must be taken not to injure the auricles and large vessels, to protect the right wall of the pericardium and thus avoid the phrenic nerves, and to take every precaution to prevent a bilateral pneumothorax.

Cardiac Massage. The methods of application, the indications therefor, and the results of heart massage in cases of collapse are known to all surgeons. An analytical study of the various methods with the object of determining their relative value has been made by Cackovic¹, who has collected 46 cases from the literature. It was found that massage of the heart had a positive result in 17 cases (37 per cent.), and in 29 instances was unavailing (63 per cent.). The positive cases were divided into two groups: Nine cases (19.6 per cent.) in which a definite return of the heart beat resulted and actual return to life took place; and 8 cases (17.4 per cent.) where cardiac contraction returned but for a short time, five to twenty-seven hours, the resuscitation being only temporary. The so-called negative results were also divided into two groups: Nine cases (19.6 per cent.) in which brief cardiac contraction took place; and 20 cases (43.4 per cent.) in which the measure was absolutely without response on the part of the heart. The subdiaphragmatic method gave the best results in the successful instances, 10 of 16 patients showed positive results, 7 living and 3 regaining temporary heart contraction. The thoracic method, used twenty-four times, gave response in 7 cases, of which 2 were permanent and 5 temporary. The transdiaphragmatic method was used six times; in each instance death resulted; in only one was there a temporary restoration of heart action. The results were better the earlier the massage was begun after syncope developed, and were best in those cases in which it was used within five minutes. The question naturally follows as to how long one may wait before beginning massage in cases of collapse; it is answered by the results of Cackovic's studies, which show that no positive result, *i. e.*, complete recovery, took place after the expiration of ten minutes.

Esophagoscopy. Direct examination is just as essential a method of investigation in diseases of the esophagus as the use of the cystoscope is in the recognition of lesions of the kidney, ureter, or bladder. In the latter instance we are utterly helpless without it, and the situation is precisely the same in the diagnosis and management of lesions of the esophagus. It goes without saying that the technique of esophagoscopy is not easy of acquisition, nor is the use of the instrument entirely free from danger. For this reason it is only proper that the examination

¹ Arch. f. klin. Chir., Band lxxxviii, Heft 4, p. 917.

for diagnosis or the operation for the removal of foreign bodies should be left to those who by reason of experience are entitled to be regarded as specialists. The lodgement of a foreign body in the air or food passages should always be regarded as a serious accident. Jackson¹ found 105 deaths in five years from foreign bodies in the air and food passages, or from ill-advised efforts at removal. He has used the esophagoscope in 41 cases for foreign bodies in the esophagus, in all but one of which the object was removed, and by tracheo-bronchoscopy he was able in 28 out of 32 patients to remove foreign bodies lodged in the air passages below the glottis. There were no deaths from any cause whatever within thirty days, which was as long as the cases were followed.

Danielsen² and Guisez,³ who have also had a large experience in the removal of foreign bodies, prefer the coin catcher to the more modern methods. In some cases, instead of producing esophageal symptoms, the foreign body caused respiratory obstruction; this makes the diagnosis difficult, and the situation is only cleared up by direct examination.

Guisez and Abrand⁴ have recorded two cases of *tuberculosis of the esophagus*, in the treatment of which they advise dilatation when the stenosis is cicatricial. In addition to the dilatation, which must be done with extreme caution, the lesion should be treated locally. Examination of the esophagus for areas of paresthesia in patients who thought they had swallowed foreign bodies has been practised by Kelly.⁵ The presence of fever, the duration of the symptoms, their intermittent and diverse character, usually enable one to distinguish between a foreign body and an area of paresthesia. Nevertheless, it is satisfactory to be able to confirm the diagnosis by direct examination. This same principle applies to the differentiation between hysterical dysphagia and that due to some organic lesion. Too many cases, according to Kelly, have been branded as hysterical when the difficulty in swallowing was due to some organic lesion. In a case of this description the writer found a stricture which in the absence of any history of trauma or infection he was compelled to regard as of congenital origin.

Lange⁶ has found the *x*-rays especially useful in very neurotic or feeble patients, when esophageal instrumentation often cannot be carried out, and in valvular heart disease when the passage of bougies is distinctly dangerous. The possible presence of an undiscovered aneurysm or other mediastinal tumor must always be taken into consideration. In the bismuth radiograph we have a simple and safe means of deter-

¹ Journal of the American Medical Association, September 25, 1909, p. 1009.

² Deut. med. Wochenschrift, December 10, 1909.

³ Presse Médicale, August 14, 1909.

⁴ Rev. de Chir., July, 1909.

⁵ Journal of Laryngology, June, 1909.

⁶ New York Medical Journal, January 23, 1909.

mining the function, position, and size of the esophagus from the pharynx to the diaphragm. The principle deviation from normal to be detected by the bismuth radiograph is diminution in size (stricture) or dilatation (diverticula). A cancer or gumma rarely attains large enough proportions to be detected by the *x*-rays.

Esophagogastrostomy. Cancer of the esophagus is one of the most insidious of diseases. Rarely does the case come under observation before there is almost complete stenosis, and then the growth may have so involved surrounding structures as to make a radical operation impossible. But, as Meyer¹ says, there are many other reasons why surgical treatment has been both dangerous and unavailing, *e. g.*, the extreme sensitiveness of the pleura, and especially of the loose connective tissue of the posterior mediastinum to the infectious secretions of the esophagus, the absence of a pleural cover to the lower third of the esophagus, and the lack of a safe method of operation. Progress in grappling with this subject will be made only by continuing, regardless of past failures, in an endeavor to improve our methods and overcome the many and serious obstacles. An exploratory thoracotomy should be resorted to more frequently, especially in cancer cases. Recognizing the many and seemingly insuperable difficulties, Meyer has endeavored by experimental investigation to find a method of joining the stomach and esophagus after resection of the latter—a method which is practical, one which will prevent leakage, insure accurate approximation, and maintain the patency of the canal. When the lesion is in the lower third of the esophagus, the following method was tried: By blunt dissection the making of an artificial opening into the abdominal cavity next to the cardia; transposition of the stomach into the thorax and fixation of same; closure of the rent in the diaphragm by stitching it to the stomach; resection of the diseased portion of the esophagus; esophagogastrostomy. This operation was carried out six times; three of the animals died and three made an operative recovery. When the carcinoma is situated in the upper portion of the esophagus, where it would be impossible to effect an anastomosis with the stomach, a gastric fistula must be established for permanent feeding. To render the operation less serious, particularly in weak patients, Meyer suggests that it be performed in two stages. In the first stage, the following steps: Thoracotomy in the seventh or eighth intercostal space; transposition of part of stomach into thoracic cavity; loose fixation suture of stomach around a rib, in order to keep the gastric wall on the stretch; closure of thoracic wound; jejunostomy for forced feeding. For the second stage, performed two or three weeks later, is reserved the removal of the growth and an esophagogastrostomy.

¹ *Annals of Surgery*, July, 1909.

Experimental Intrathoracic Esophageal Surgery. The object of this work of Janeway and Green¹ was limited to the two problems: (1) Circuiting the cardia by the establishment of an anastomosis between the stomach and the esophagus, and (2) the resection of a portion of both the stomach and esophagus. Two methods of artificial respiration were used, the inflation of the lungs with an intubation tube, which offers two advantages: an artificial apnea is developed, which abolishes all muscular respiratory effort, and a greater range of ether administration, with consequent decrease of danger of death in narcosis. The cabinet offers the advantages of not requiring a tube in the larynx, and on account of the pressure on the head, less ether is used.

The advantages of each method are so decided that the authors have constructed a cabinet which combines the features of each of the above-mentioned methods. An air-tight box receives the head, and suitable openings are provided for the hands of the anesthetist and for a window through which the anesthetist may watch the animal. The peculiar feature is a motor-driven mechanism by which the pressure of the air in the cabinet varies from a decided positive pressure to that of the atmosphere. This rhythmical change of pressure causes, as with an intubation tube, the diaphragm and intercostal muscles to remain at rest, a desideratum not obtained with a constant positive pressure. The technique of their operations on sixty-nine dogs is fully described. The results are summed up as follows: "Even with our latest technique the results are far from satisfactory. We have, however, successfully accomplished four resections of the cardia and esophagus, and six lateral anastomoses of the stomach and esophagus without resection."

"Nevertheless, our work indicates that with a further improvement of technique the anastomosis with resection can be accomplished without so great a mortality, and will eventually prove a procedure of promise. On the other hand, we have already shown that an anastomosis of the esophagus with the stomach without a resection, under our present technique, is attended with a low mortality."

¹ Journal of the American Medical Association, 1909, liii, No. 24.

INFECTIOUS DISEASES, INCLUDING ACUTE RHEUMATISM. CROUPOUS PNEUMONIA, AND INFLUENZA.

By JOHN RUHRÄH, M.D.

THE review of the literature pertaining to infectious diseases for the year 1909 shows a continued interest in investigations along certain lines. It is curious that the more common infectious diseases, scarlet fever and measles, have received comparatively little attention, while a great deal has been devoted to the other classes of infectious diseases, particularly those occurring in the tropics. This increase in interest in tropical diseases is a natural outcome of the brilliant results obtained in certain hot countries, where, owing to advanced sanitary measures, places heretofore almost uninhabitable have become as safe as, and one might even say safer than, most Northern cities.

It seems strange to note in this connection that, at the time of writing, a bill has been introduced into both Houses of Congress to make the sanitary department at Panama subordinate to one of the other department chiefs, which would mean going back to the condition of affairs that existed at the beginning of the building of the Panama Canal, and which was found to be unsatisfactory. It was not until the sanitary department was given representation on the board and a free hand that the marvellous results were attained. It seems that sensible ways of dealing with sanitary problems have an unusually hard time in becoming firmly established.

There have been a number of articles during the year concerning the relation of protozoa to infectious diseases, and more attention is being paid to insects as carriers of disease, the common house fly coming in for general condemnation as being a carrier of typhoid, dysentery, and of infantile diarrhea, as well as other diseases at times, to say nothing of the contamination of milk and food by bacteria producing decomposition.

Human carriers of disease have also been more thoroughly studied than ever before, and next to the patient may be regarded as the most frequent source of infection in certain diseases, particularly typhoid and diphtheria.

The Bordet-Gengou reaction, which marked an epoch in the study of infectious diseases, has been made the subject of investigation by

many observers, and further research has been undertaken in the practical diagnosis of syphilis in the so-called Wassermann-Neisser-Bruck reaction. It has also been used in typhoid, echinococcus disease, and smallpox.

Bordet and Gengou a few years ago also discovered a small bacillus which they believed to be the cause of whooping cough, and this has been a matter of interest, although comparatively few reports concerning it have been published during the year.

The Flexner-Jobling serum in the treatment of cerebrospinal fever continues to meet with commendation on all sides, and a new method of diagnosis by precipitins has been suggested by Vincent and Bellot. This, if found to be reliable, would simplify the exact diagnosis of cerebrospinal fever very much, and similar methods may be applicable to other diseases.

One of the most important contributions of the year is the announcement by Flexner and Lewis that they have been able to transmit anterior poliomyelitis to monkeys, and from these monkeys to others through a series of a sufficient number to demonstrate that they were carrying the virus of the disease which had developed in the animal itself. This should stimulate researches into the nature of this disease, which has not been studied as extensively as its importance would seem to warrant.

In typhoid fever the ophthalmic test has been used in diagnosis following the same general principles as that employed in tuberculosis, and the few observers who had experience with it claim it to be reliable, and under proper restriction a safe method for general use. This will, of course, need further study, but anything which promises an early, exact diagnosis in typhoid is of great value.

Unusual interest has been taken in the hookworm, and the large donation made by Rockefeller for the study of the disease and the relief of the conditions in the South ought to yield a rich reward in the near future.

After the fourth disease we have the fifth disease described by Watson, and we may confidently look for a description of the sixth disease unless some one discovers some more exact method for the differential diagnosis of the acute exanthemata, a wish that may not be as utopian as it appears in the light of what has been accomplished by Bordet, Gengou, and others.

Vaccine therapy has received a fresh impulse by the fact that stock vaccines may be used with apparently as satisfactory results as those obtained from the germs isolated from the patients, so placing this method of treatment at the disposal of anyone who is able to make an exact bacteriological diagnosis.

Hiss has published an account of his method of treatment of disease with an extract of leukocytes which promises to be of service in certain conditions.

A review of these and many other contributions is given below, and,

while all articles relating to infectious diseases could not be considered, it is hoped that the more important and interesting reports of the last year have received due attention.

The Principles of the Wassermann and Similar Reactions. While syphilis is dealt with in the September number of *PROGRESSIVE MEDICINE*, a review of the literature of infectious diseases would not be complete without some reference to the principles underlying the Wassermann tests, about which so much has been written of late. The rapidly changing terminology and much useless theorizing has given rise to a literature difficult of comprehension unless much time and attention is paid to it. This brief explanation will doubtless be welcomed by many who have not time to unravel the tangle for themselves. A practical working knowledge of the reactions can only be acquired by much actual experience.

Several definitions must first be given. An *antigen* is any substance which, when introduced into the body of an animal, gives rise to the formation of antibodies. These antibodies are called amboceptors (immune bodies), and they are not necessarily antitoxic or protective.

To complete the reaction a third thing is necessary—the complement which is present in all normal fresh sera and which is destroyed by heating to 56° C. for an hour.

The reaction may take place with bacteria or blood. Hemolysis is that change which takes place when the blood serum of one animal is added to the blood serum of another. Thus, if rabbit serum be added to sheep's blood, a solution of some of the sheep's corpuscles takes place. If the rabbit be treated by injecting sheep's corpuscles, and the serum withdrawn, it will be found to have the power of dissolving corpuscles greatly increased. The substance formed in the blood that increases the dissolving power is the antibody, or immune body, or the amboceptor of the reaction. A similar bacteriolytic reaction may take place. For example, an emulsion of typhoid bacilli, the serum of a patient with typhoid fever and a normal fresh serum, say, from a guinea-pig, represent respectively antigen, an amboceptor, and complement. If these are incubated half an hour at body temperature the bacteria will dissolve.

In 1901 Bordet and Gengou discovered that if to such a reaction two elements of a hemolytic reaction be added, say sheep's corpuscles and amboceptor, then, if the reaction is complete, there will be no complement left to complete a hemolytic reaction, and this method is utilized to show whether a bacteriolytic reaction has taken place or not, as without it there is no visible change in the appearance of the bacterial tubes.

The blood of the patient to be tested is heated to 56° C. for half an hour, to destroy any complement in it, as the amount present is an unknown quantity. The complement used, that of guinea-pig serum, can easily be measured.

The Wassermann-Neisser-Bruck reaction for syphilis is an application of this test, using instead of a culture of spirochetæ, which could not be obtained, an extract of a liver of a fetus in which the spirochetæ have been demonstrated. The reaction is performed by mixing the extract of the fetal liver (antigen), the blood of the patient to be tested (amboceptor), the blood serum from a guinea-pig (complement), serum from a rabbit previously treated with sheep's corpuscles (hemolytic amboceptor), and sheep's corpuscles (hemolytic antigen). If there is hemolysis of the sheep's corpuscles the reaction is negative, as it shows that the complement was not used to complete the bacterial reaction. If hemolysis does not take place, the test is positive, as it shows that the reaction has been completed and there is no complement left.

Several modifications of this test have been proposed. Bauer utilizes the hemolytic amboceptor present in the patient's blood (it must be supplied if infants are tested). This test is said to work out practically in spite of some theoretical objections.

Noguchi has modified the original reaction by impregnating small squares of paper with the antigen, complement, and amboceptor, and drying them, and he uses a solution of a drop of human blood (not the patient's) in 4 c.c. of normal salt solution. Noguchi has even suggested the use of the vest pocket in place of the incubator, and has so devised a test which may be easily used and which is said to give satisfactory results. As a matter of fact, it requires considerable experience with the reaction to obtain good results.

Fox¹ has given a short but comprehensive account of the Wassermann test and its practical application, as well as of the more recent modifications.

The Relation of Alcohol to Immunity. There has been so much discussion regarding the action of alcohol, especially as it relates to infectious disease and to the method of its action, that Parkinson's² study from the Wellcome Physiological Research Laboratories will be read with great interest.

It has been shown by various observers that animals given alcohol are less resistant to various infections; thus, Abbot has shown that such animals are more sensitive to the streptococcus and staphylococcus and *Bacillus coli*, and Laitman found that the dose of anthrax vaccine which is not fatal in normal animals proved so to those that had been given alcohol. Metchnikoff has stated that alcohol is harmful to the phagocytes, rendering them less active, and Woodhead that it reduces the antibodies in the serum. Parkinson found that alcohol in small quantities had no action upon the phagocytic activity, and that there

¹ Medical Record, March 13, 1909, p. 421.

² Lancet, November 27, 1909, p. 1580.

was no change until it was present in 12.5 per cent. Small quantities of alcohol injected into rabbits may stimulate the production of antibodies temporarily, while a large dose lowers the opsonic index for twenty-four hours, and that continuously moderate doses cause a permanent lowering of the index. In animals that had been alcoholized the reaction to vaccines is much less effective than in normal animals, and the difference is still more marked when living microorganisms are used.

Transmission of Infectious Diseases. Our ideas concerning the methods of transmission of various infectious diseases have undergone alteration in the past few years, and we now need a readjustment with the means taken to prevent the spread of diseases. There have been a number of articles written concerning these points, among which may be mentioned those of Doty,¹ Edsall,² and Chapin.³

Infectious diseases are transmitted in several ways. In some instances an intermediate host is required, usually an insect which takes the infectious material into its body and transmits it later on to human beings. The patient may transmit the disease directly, as is most frequently the case; for example, a case of diphtheria or measles mingling intimately with other people may infect a large number of individuals very easily. The cases which are most liable to transmit the disease because they are unrecognized are the mild, the convalescent, and the atypical cases. Again, the disease may be transmitted by an individual apparently in perfect health who has been associated with someone with the disease, and harbors in his mouth or elsewhere the disease-producing germs. Such an individual is called a disease carrier. The disease may also be transmitted by objects which have come in contact with the sick person or his discharges, and such objects are spoken of under the general head of fomites. Lastly, the disease may be transmitted through the air, but this happens very rarely, and only under exceptional circumstances.

To correctly prevent the spread of any given disease it is necessary to know the cause and how it is transmitted. Three examples of changes in our ideas regarding the transmission of disease are afforded in the instances of malaria, yellow fever, and bubonic plague. In the case of the first, for many centuries transmission was blamed upon the air; in fact, the very name of the disease indicates this, and even today in malarial districts people are warned against breathing the night air. We now know that malaria is only transmitted by means

¹ The Means by Which Infectious Diseases are Transmitted. *The American Journal of the Medical Sciences*, July, 1909, p. 30.

² Prophylaxis Against Infectious Diseases from the Standpoint of the Practitioner. *Journal of the American Medical Association*, January 9, 1909, p. 123.

³ Air Infections of Minor Importance. *Journal of the American Medical Association*, December 12, 1908, p. 2048.

of the mosquito, and where this factor is eliminated the disease stops spreading.

In the case of yellow fever, transmission was thought to be by the air, but especially by fomites, hence the severe and unjust quarantine regulations. We now know that the disease is only transmitted through the mosquito, and the protection of individuals from mosquitoes in a rational manner is all that is necessary. The brilliant results obtained in Havana and Panama are too well known to need more than mention.

In the case of plague, the disease is transmitted by rats and fleas, and fomites probably play either a very minor role or none at all.

As regards the transmission of disease through the air, it is quite safe to say that all cases reported pretending to prove that diseases are carried through the air for any distance are usually erroneous observations, and, where careful investigation has been carried out, it has usually been found that disease has been carried in some other way. I think it is quite safe to assert that diseases are not carried through the air, with the possible exception of measles and chickenpox, and in these diseases the range is but a small one. In whooping cough, during the paroxysm, the patient causes a small spray of mucus and saliva, which may infect the air for a short time for a few feet in front of him.

In regard to fomites, as Doty points out, there is probably little or no danger from rags, money, and similar things. Bank clerks and rag pickers do not suffer from infectious diseases any more than other individuals. Articles soiled by coming in contact with patients with certain diseases, as typhoid fever, may be a source of danger, especially by infecting food or drink, but when the rational disinfection of such articles is carried out, there is, of course, no danger from them.

A fact which has recently been studied very extensively are so-called carriers of infection who are responsible for a great many epidemics. Typhoid fever, cholera, and diphtheria are the diseases most commonly carried in this manner, and it is well known that perfectly healthy people may harbor virulent germs of these diseases over long periods of time, and where this fact is recognized and taken advantage of, epidemics may be promptly checked. By far the most frequent means of spreading infection is the patient himself. This brief consideration makes quite clear the means that ought to be used in preventing the spread of disease, and the methods used will vary, of course, slightly with the disease under consideration.

In a general way, it may be stated that persons having infectious diseases should be isolated. The fewer people who come in contact with the disease the fewer will get it. The patient should be protected from mosquitoes, flies, and other insects, especially from mosquitoes in case of yellow fever and malaria, and from flies in the case of typhoid fever and cholera, and from fleas in case of the plague. All individuals coming in contact with the patients, as nurses, physicians, and attendants,

should not be allowed to go about if they are found to be carriers of infection. The proper disinfection of hands and a little care will usually eliminate this in most instances, but to be perfectly sure, bacteriological examinations would have to be made in some cases. The disinfection of towels, bedclothes, and other objects which come in contact with the patient is of particular necessity in case of most diseases, and the disinfection of the discharges is of especial importance in case of cholera and typhoid fever. Doty suggests a simple means of disinfecting excreta by boiling, it being a cheaper and more efficient method than the use of chemical disinfectants, which are rarely used in an efficient manner.

Edsall, as well as many others, calls attention to the necessity of educating the public, and we might add physicians and nurses as well, in the proper methods of preventing the spread of disease. In case of the public, the education should be done in such a way as to avoid extreme measures, and it should be borne in mind that among the poorer class of people, after a certain degree of poverty is reached, education is of no avail.

THE HOUSE FLY AND THE TRANSMISSION OF DISEASE. The common house fly is becoming more and more identified with the spread of disease, particularly *typhoid fever*. There have been several valuable contributions made along this line, and among these are the articles of Coward,¹ Felt,² and Howard.³

The fly is usually regarded as a necessary scavenger, but, as someone has suggested, the fly as a scavenger is no more needed, if the proper means of cleanliness are employed, than the street scavenger dogs of Constantinople.

In addition to typhoid, it is very probable that tuberculosis, cholera, diarrheal diseases of infancy, and other diseases may be carried by it. Felt has found that the insect does not, as a rule, travel more than 300 to 500 feet from its breeding place, and it is therefore important to destroy, as far as possible, all places where flies breed. In cases of contagious diseases, all doors and windows should be screened, and it would seem most desirable in every instance to screen both dining rooms and kitchens, and this should also be extended to provision stores and markets, certainly for the classes of food that are eaten without further preparation. All decayed material should be removed and burned or otherwise destroyed, and especial attention should be paid to stables and manure piles.

Flies in a room may be got rid of by burning pyrethrum powder

¹ The Common House Fly. Journal of the American Medical Association, June 5, 1909, p. 1871.

² Control of Household Insects. Bulletin of New York Educational Department.

³ House Flies. United States Department of Agriculture, Bureau of Animal Industry.

or by the use of formaldehyde, two teaspoonfuls of the latter being added to a pint of water, and this being placed in saucers about the room.

Open drains, vaults, and cesspools are, of course, among the greater sources of danger.

Nash¹ has contributed a study of the house fly, and he is inclined to believe that the fly travels farther than was determined in the observations by Felt, and that they will travel from their breeding place to the nearest house, or to the nearest places where there is food, sometimes going even over half a mile. Nash has contributed four papers on the subject of the house fly and the occurrence of epidemics of *summer diarrhea*, and believes there is a very close connection between the prevalence of flies and the prevalence of such diarrheas, and that the fly plays a very large part in the infection of milk. He believes that the disease may also be transmitted by the fly settling upon the nipples and pacifiers, and also by germ-laden flies settling on or even getting inside of the mouths of sleeping infants, as has been confirmed by Glover in his contribution in the *Lancet*, 1908.

Standish McCleary, in making routine examinations of the milk from one of the larger dairies, found that during the warm months of summer the colon bacillus was quite constantly found, and that as soon as the weather became sufficiently cool and there were no longer any flies the colon bacillus disappeared. The dairy in question is taking steps to protect the milk from flies during the coming summer. In this connection it is interesting to note that wherever a health officer has made a determined effort to rid any community of flies, which, of course, involves a very extensive cleaning up of the entire town, he has been removed from office within a very short time after his efforts begin to be effective, showing with what extreme difficulty innovations are made in sanitation.

Pathogenic Protozoa Found in Man. For a great many years great attention was paid to the various forms of bacteria, but more recently attention has been called to the fact that a certain number of diseases, particularly tropical diseases, are caused by protozoa.

Kerr² has given an account of the more important ones found in man. The protozoön is a unicellular individual complete in itself and not composed of a number of specialized cells. They are separated from the bacteria by the fact that the latter are limited by a definite capsule, and there is usually no obvious distinction in the protoplasm of nucleus and cytoplasm. The protozoön represents the simplest form of animal life, and never develops beyond the unicellular stage. They are divided into four classes—the sarcodina, mastigophora, sporozoa, and infusoria.

¹ Journal of Hygiene, September, 1909, p. 141.

² New York Medical Journal, October 9, 1909, p. 684.

The sarcodina have no permanent organ of locomotion, but movement and feeding are accomplished by temporary protoplasmic processes. They all have resting stages, during which they protect themselves against unfavorable outside conditions or enter a period of reproduction. There are several orders of this class, but the only order of interest to the medical man is that which contains the genus ameba. Schaudinn has given the two species which are pathogenic in man the name entameba. The *Entamœba coli*, which produces dysentery, must pass through a resting stage before it becomes infective, and this is only possible outside the body and in very warm climates. The second variety, *Entamœba histolytica* was considered by Schaudinn to be the only cause of amebic dysentery and of liver abscess.

In the second class, the mastigophora, there are one or more permanent organs for locomotion and for feeding, the only form of interest to the physician being the subclass flagellata, to which belong the genus trypanosoma and the allied spirocheta. The *trypanosomes* have a more or less spindle-shaped body, along one side of which is an undulating protoplasmic process something like a fin. Near one end is the blepharoplast or nucleus, from which a fine flagellum runs along the edge of the protoplasmic process to the other end and then continues as a free flagellum. Non-sexual and sexual forms may be distinguished, and of the latter are males and females.

Most of the trypanosomes do not produce disease in the animals in which they live, but there are a group which are found in mammals which are particularly interesting. These may adapt themselves to various hosts, and are usually transferred either by biting insects or by artificial inoculation. They may be harmless for one host and produce symptoms in another. The *Protoplasma brucei* is a harmless parasite of wild antelopes in Africa, but produces in horses and cattle a disease called "nagana." There are several others producing diseases in horses and cattle, the most interesting of all being the *Trypanosoma gambiense*, which produces sleeping sickness in man.

The spirochetæ are closely allied to the above, and have the appearance of small slender threads spirally twisted. The most important are the *Spirochæta recurrentis* (the *Spirochæta obermeierei*), which produces human relapsing fever, and *Spirochæta duttoni*, the cause of South African tick fever, the *Spirochæta pertenuis*, the cause of yaws, and the *Spirochæta refringens*, found in ulcerated syphilitic lesions together with the *Treponema pallidum*. This last was first described as a spirocheta, but differs from them in that it has fine, sharp, corkscrew-like coils and a slender prolongation like a flagellum at either end. Closely allied are the Leishmann-Donovan bodies, the cause of kala azar, and Ross has given these the name of the *Leishmania donovani*. There are several others of this group of minor importance.

The sporozoa are without organs of locomotion, and multiply by

some method of sporulation and live only as parasites in the cells of other animals. They include the malarial organisms, which need not be mentioned further.

The last class, the infusoria, have organs of locomotion in the form of cilia. Only one of these is of special interest, being the *Balantidium coli* found in the rectum of the hog, which has also been found in man, giving rise to a form of diarrhea.

The Treatment of Acute Infectious Diseases with Extract of Leukocytes (Hiss). Lambert¹ reports his experiences with Hiss' method of treating infectious diseases. In general, the method may be said to consist of the subcutaneous injection of an aqueous extract of dead leukocytes taken from rabbits. These leukocytes are secured free from bacteria by the use of injections of aleuronat into the pleural cavities of these animals. The exudates are then centrifugalized, washed free from serum with saline solutions, and then extracted with an amount of distilled water equal in bulk to the original amount of the exudate. Usually the leukocytes were obtained from normal rabbits, but in a few instances the rabbits were previously immunized to the bacterial cause of the disease to be treated. With this exception the same remedy was applied to all infectious diseases, the effect being to neutralize the toxins and also to increase the phagocytic action of the patient's blood. Lambert has tried this method in cases of meningitis, pneumonia, ulcerative endocarditis, and malaria, and it has also been used in chronic furunculosis and acute erysipelas and other forms of septicemia. He does not regard it as a cure-all, but as a new help in bacterial diseases before the exact bacterial diagnosis has been established. Only the most severe cases of disease were treated by this method.

This method of treating infections is of particular interest, as it had been theoretically worked out in the laboratory by Hiss before being tried on human beings. Hiss inferred from his observations that there was power to neutralize toxins, set free from the dead bacteria, within the phagocyte in the cells themselves, and this is quite independent of the antitoxic bodies of the blood plasma. He inferred that these intracellular neutralizing bodies act upon the poisons liberated from the germs after these bacteria die in the processes of phagocytic action. Such poisons are known as endotoxins, and Hiss would call his theoretical neutralizing bodies "endo-antitoxins."

Hiss and Zinsser,² after a careful study of eleven cases of staphylococcus infection treated by the above method, conclude that marked improvement in, and often cure of, localized staphylococcus infection may be obtained by careful and systematic treatment with leukocyte extract.

¹ American Journal of the Medical Sciences, April, 1909, p. 506.

² Journal of Medical Research, April, 1909, p. 245.

Vaccine Therapy. The literature of this subject has been reviewed briefly by Duncan.¹ It is very difficult to give the present status of vaccine therapy, as the reports are scattered, often made by inexperienced observers, and sometimes brilliant results are reported in a few cases which have been treated not only by vaccines but by the usual methods. At present there are a great many enthusiasts, and there are also some who have looked askance at this method from the beginning, the truth probably being that there are some diseases which may be treated very satisfactorily by this method, and it remains for the future to find out what these are and also to determine better methods of dosing.

As long as the use of the method depended upon Wright's opsonic index as a control it was out of the hands of the general practitioner, but since it has been found that the size and frequency of the dose may be determined fairly satisfactorily by clinical symptoms, there has been greater interest taken. Just at present there are a number of stock vaccines widely advertised by the various drug houses. Apparently the best results have been obtained by preparing the vaccines from the organisms isolated from the patient himself, but this method cannot be used by the average general practitioner. In many instances the so-called stock vaccines, those prepared from a culture and not taken from any particular patient, but made in large quantities at some central laboratory, are quite as efficacious as the autogenous vaccines.

It still remains, however, for the physician to note exactly the nature of the microbe that is producing the disease, and this can only be determined by bacteriological study.

The diseases in which it has been tried with greatest success are the staphylococcus infections, especially recurring boils and carbuncles; sycoses due to the staphylococcus, and pustular acne have also been successfully treated by this method.

The dose varies, but it is perfectly safe to begin with one hundred million bacteria, repeating the dose in from five to seven days and increasing up to five hundred million.

In streptococcus infections vaccines made from various strains of streptococci have been employed, but not with as brilliant results as in the case of staphylococcus infections. The dose has not been determined, and various quantities, varying from two to twenty million or more, have been used. They have been recently tried in puerperal infections. Improvement has been reported in cases of pneumonia and in other forms of pneumococcus infection.

In tuberculosis tuberculin is used, in place of vaccines, prepared in the ordinary manner, and in certain selected cases it has been used with good results. It apparently requires considerable skill in knowing how much to give and when to give it.

¹ New York Medical Journal, November 6, 1909, p. 893.

THE TREATMENT OF PNEUMONIA WITH VACCINES. Harris¹ reports his studies in eleven cases of pneumonia, and he believes, as the result of his studies, that successful vaccination for pneumonia is possible, and that it does no harm. It should be done as early as possible in the course of the disease, and the vaccine from one or more virulent strains should be used, preferably made from organisms obtained from the patient. He does not consider that the estimation of the opsonic index is necessary, but that the observation of temperature and physical signs is sufficient guide in gauging the repetition of the dose.

VACCINE THERAPY IN CHILDREN. Kerley² has reviewed briefly the results of vaccine therapy in children.

His experience with the opsonic index is practically that of all other observers, that it is too uncertain to make it of practical value in following cases systematically. The forms of infection in which the vaccine treatment has given the best results are the staphylococcus infections; while it is not necessary that the vaccine be prepared from the staphylococci taken from the patient, it is a good plan whenever it is possible.

The dose in infants under one year is seven million to fifteen million of dead cocci, and in infants between one and two years, fifteen million to twenty million may be given, and in children over three years, twenty million to fifty million may be used. Inoculation is repeated on the sixth to the tenth day if necessary. Excellent results have been obtained in furunculosis. Some observers have obtained good results in the treatment of acne, while others report negative results. These vaccines have also been used, it is said, with success in cases of otitis media of staphylococcus origin, of suppuration in the antrum, and in cases of osteomyelitis.

Streptococcus infections are less amenable to vaccine treatment, and the dosage given is smaller—about one-third of the number as stated for the staphylococcus. So far the use of streptococci in erysipelas has proved of but little value, nor have they been of service in scarlet fever, although favorable results have followed the injections when there has been a local streptococcus inflammation, as in adenitis or otitis media. In vulvovaginitis due to gonococcus in young infants the injections have no effect upon the disease, but in older children, in the chronic cases, Hamilton and Cooke have obtained some satisfactory results.

Pneumonia has so far not been treated to any advantage, but Ross claims to have obtained good results in empyema of pneumococcus origin.

In cerebrospinal fever, injections of the meningococcus of Weichselbaum have been tried, but has been superseded by the antimeningitis serum of Flexner and Jobling.

¹ British Medical Journal, June 26, 1909, p. 1530.

² Journal of the American Medical Association, October 9, 1909, p. 1179.

In cases of cystitis due to the colon bacillus injections in doses of ten million to fifty million are said to have given good results.

† **Cerebrospinal Fever.** THE TRANSMISSION OF CEREBROSPINAL FEVER. One of the most important contributions that has been made to the literature on meningitis is the monograph by Elser and Hontoon,¹ of Cornell University Medical College.

They have studied 210 cases, and, after considering the various points relating to the transmission, are of the opinion that the disease is transmitted directly from person to person, as the meningococcus does not resist drying or sunlight, and soon dies. They believe that the disease is spread by meningococcus carriers, and that, as has been previously demonstrated, a large number of individuals who have been in the immediate neighborhood of meningitis cases may have the meningococcus in their respiratory tracts without ever contracting the disease, and yet be in a condition to transfer it to someone else. The organism is rarely found in healthy individuals apart from epidemics, but it is undoubtedly true that there are certain individuals who may harbor this organism in their pharynx. They are inclined to be of the opinion that the meningococcus first invades the blood stream, and is carried in this way to the meninges, which in the human being seems to form an ideal culture medium. Attempts to produce the disease in animals by this method are not successful. The rather prevalent opinion of most authorities is that the meninges are reached by direct extension from the nasal passages.

An effort to standardize the *antimeningitis serum* was made by Jobling,² who found that the high variability in infectivity of the *Diplococcus intracellularis* makes it impracticable to standardize the antimeningitis serum on the basis of the virulence of the diplococcus, and that it is also impossible to standardize on the basis of the endotoxin value, owing to the irregularity of reaction of small animals to the endotoxin. The absence of any established relation between the complement-binding power and the therapeutic activity render the employment of this method impossible. Jobling suggests the employment of the specific opsonins as a measure of the therapeutic activity of the serum. His article deals with the technical side of the question, for the details of which the reader is referred.

THE PRECIPITIN REACTION IN CEREBROSPINAL FEVER. Vincent and Bellot³ have made two important communications upon this new method of making the diagnosis in cerebrospinal fever.

If one mixes an agglutinating serum in the presence of a filtrate of the culture of a corresponding microbe, a sort of coagulation is produced

¹ Journal of Medical Research, 1909, p. 397.

² Journal of Experimental Medicine, July, 1909, p. 614.

³ Bulletin Académie de médecine, vol. lxi, p. 326, and Bulletin Société Médicale des Hôpitaux, 1909, p. 952.

which is plainly visible to the naked eye. In the same way an anti-meningitis serum will produce in from seven to eight hours a similar clouding if added in 1 or 2 per cent. to a maceration of meningococcus in normal salt solution. Acting upon this suggestion, Vincent and Bellot centrifugalized very completely cerebrospinal fluid, and then placed the clear fluid in three test-tubes in quantities of 100 drops in one and 50 in two others. To two of these they add one drop of serum. The third tube is used as a control. The tubes are placed in an incubator preferably at a temperature of 50° to 53° C. to prevent the multiplication of bacteria. In from eight to twelve hours in the case of meningitis due to the Weichselbaum meningococcus there is characteristic clouding, while the control tube remains clear. The reaction is negative when the meningitis is due to other bacteria or in normal subjects. In 61 cases in which this was tried the reaction was uniformly negative in the fluid from healthy subjects, and when the meningitis was due to other bacteria than the meningococcus, while it was positive in 32 cases of cerebrospinal fever.

There is no relation whatever between the severity of the disease and the intensity of the reaction. The reaction permits one to make a diagnosis in the absence of all other examination, and sometimes with perfectly clear cerebrospinal fluid. The reaction is absent in the earliest period of the disease, and was found in two cases, eleven to thirteen hours respectively after the beginning. It begins to grow weaker from the twelfth to the twentieth day, and gradually disappears. Either the serum of Flexner or Wassermann may be used.

They also found that in two cases of *pneumococcus meningitis* there was a positive reaction with the antipneumococcus serum of Kolle, and in one case of *streptococcus meningitis* there was a clouding with the addition of an antistreptococcus serum.

The value of this reaction has been confirmed by Louis and Salebert, but Letulle and Lagane found that the cerebrospinal fluid from meningitis cases sometimes precipitates spontaneously without the addition of serum in the incubator. In such cases the reaction would be inapplicable, but this has not been noted by other observers.

THE DIPLOCOCCUS IN POSTERIOR BASIC MENINGITIS. Martha Wollstein¹ has made a thorough study of the diplococci isolated from cases of posterior basic meningitis. In 1898 Still concluded that posterior basic meningitis was merely a sporadic form of cerebrospinal fever, and that the organisms found were the same. In the past few years certain British observers, particularly Houston, Rankin, Eve, and Clements, have been of the opinion that while the organisms have much the same cultural characteristics, they differ in their opsonic and agglutinating properties.

¹ Journal of Experimental Medicine, July, 1909, p. 579.

Wollstein's studies were undertaken with three strains of diplococcus obtained from Dr. Houston, and she concludes that it is impossible to find any reliable criteria of difference between the *Diplococcus intracellularis* obtained from typical cases of epidemic meningitis and those obtained from posterior basic meningitis. She was able to infect monkeys with these latter, and obtained rapidly fatal forms of meningitis. She suggests that the antimeningitis serum would be useful in these cases, especially if it were administered early in the disease.

Cholera. Among the attempts that have been made to produce a curative serum for Asiatic cholera, the work of Schurupow¹ must be noted. He started the idea that the poison of the cholera germ was an endotoxin which he was able to obtain by various methods. With this he immunized horses by injecting it intravenously, and obtained an antitoxic serum which was able to protect guinea-pigs. Guinea-pigs given an injection of the serum were protected perfectly from the lethal dose of the endotoxin, and most of the guinea-pigs could be saved even when the serum was given from three to six hours after the fatal dose had been administered.

This serum has been tried by Berdnikoff, and the results, while not very striking, show a smaller mortality than in the cases not treated, and also a smaller mortality than the average death rate from cholera of the entire world for the same month. In view of these facts it would seem possible to obtain in the future some perfected method of treating Asiatic cholera.

"Common Colds." This term "cold" is usually used to cover various varieties of mild catarrhal diseases of the upper air passages, and there are great variations in the amount of disturbance both locally and generally. Owing to the very large number of bacteria present in the nose and throat of healthy individuals, it is exceedingly difficult to determine just what bacteria are the causes of common colds. It is very probable that quite a number of different organisms may produce lesions, and it is also probably true that sometimes combinations of these may be the cause.

Benham² has been studying the question, and has concluded that the four organisms most commonly found are the *Micrococcus catarrhalis*, the *Micrococcus paratetrageus*, the *Bacillus septus*, the *Bacillus Friedländer*, and it is also probable that the *Bacillus influenzae* and the *pneumococcus* may be present in mild catarrh.

Benham is of the opinion that Allen's work of treating cases of cold by means of vaccines prepared from the bacteria isolated from the case to be treated is correct, and is undertaking a study upon this subject the results of which should prove very interesting.

¹ *Russk. Vrach.*, St. Petersburg, 1909, viii, p. 597; 633.

² *British Medical Journal*, August 28, 1909, p. 534.

Dengue. Jones¹ records an interesting epidemic of this disease in the Philippines, which, in spite of sanitary measures, spread through several companies of soldiers. The precautions used were chiefly screening the men from mosquitoes. All the men in the barracks were required to keep their mosquito bars around them at all times, especial care being taken to screen the sick.

There was nothing particularly notable about the epidemic except that the severe pain in the back and extremities, which is supposed to be the commonest symptom, was absent. Almost all the cases had a sudden onset, severe frontal headache, pain in the chest, and in some cases a chill and in some a cough. The initial temperature was very high, 104° or 105° F. In about half the cases there was a secondary rise of temperature, while in the others this was not present.

This epidemic adds slight confirmatory evidence to the work of the Board for the Study of Tropical Diseases in the Philippine Islands, which is working on the question of the transmission of this disease by the mosquito.

Diphtheria. DIPHTHERIA CARRIERS. Myer Solis-Cohen² contributes an article on this important subject, and details his studies in the routine examination of school children. He concludes that persons coming in contact with diphtheria patients frequently have virulent diphtheria bacilli deposited on their mucous membranes, and that such individuals may develop diphtheria later on, or, remaining healthy, may act as diphtheria carriers and transmit the bacilli to others. To prevent this he considers the best method is to isolate such carriers until bacteriologically clean. Realizing that they must be recognized before anything can be done, he advocates the taking of cultures from the throats of all inmates of every house where diphtheria exists. He does not believe that any progress need be expected in the prophylaxis of diphtheria so long as this method of transmission is neglected.

DIPHTHERIA TRANSMITTED BY ANIMALS. Fisher³ has reported an interesting epidemic of diphtheria in an institution for the insane in which the disease was transmitted by rats and cats, these animals having gotten the disease germs on their feet and fur from infected sewer pipes. The source of the epidemic was only discovered after bacteriological examinations.

CUTANEOUS DIPHTHERIA. Eddowes⁴ and, more recently, Nash⁵ have called attention to the much more common occurrence of cutaneous diphtheritic infections than has formerly been supposed. The diphtheria

¹ Boston Medical and Surgical Journal, January 4, 1909, p. 46.

² Journal of the American Medical Association, January 9, 1909, p. 111.

³ Diphtheria Epidemic. Journal of the American Medical Association, February 6, 1909.

⁴ Lancet, September 5, 1908, p. 732.

⁵ Practitioner, January, 1909, p. 110.

bacillus has been found in various forms of chronic impetigos and eczemas, and some of these cases have been the means of transmitting infections to other individuals. The treatment by means of diphtheria antitoxin has been very satisfactory. All observers who have had any experience with cutaneous diphtheria agree that there is a peculiar appearance about it which leads one familiar with the affection to suspect the diagnosis, which is easily made by cultures and smears.

DIPHTHERITIC PARALYSIS. Rolleston¹ has contributed a most interesting article based on the study of 1500 cases of diphtheria. In 335 of these cases or 22.3 per cent., there was some form of paralysis. In 135 it was severe, and in 58 cases fatal. He found that there was a direct relation between the initial attack and the frequency and severity of the paralysis, as is very well shown in the following table:

THE RELATION OF PARALYSIS TO CHARACTER OF INITIAL ATTACK.

A. Faucial cases with or without nasal and laryngeal involvement.

Character of initial attack.	No. of cases.	Paralysis cases of all kinds.	Percentage.	Severe paralysis cases.	Percentage.
I. Very severe	146	104	71.2	72	49.3
II. Severe	274	133	48.5	55	20.07
III. Moderately severe . .	130	28	21.5	1	0.7
IV. Moderate	364	56	15.3	7	1.9
V. Mild	516	14	2.7	..	...
VI. Very mild	49	..	....	..	...
Total	1479	335		135	

B. Nasal cases only, moderate, 2
 mild, 6
 very mild, 2

C. Laryngeal cases only, severe, 7
 moderate, 3
 mild, 1
 ———
 21

Followed by no paralysis.

Diphtheritic paralysis is found to be more common in children than in adults, which is contrary to the common opinion based largely on the observations of Landouzy. Rolleston explains this by the fact that the mild forms of paralysis are more easily overlooked in children than in adults. The table showing the relation of age to paralysis is of great interest.

¹ Practitioner, January, 1909, p. 110.

SHOWING THE RELATION OF AGE TO PARALYSIS.

Age.	No. of patients.	Number of paralysis cases.	Percentage of paralysis cases.
Up to 2 years	78	15	19.2
2 to 6 years	707	181	25.6
6 to 10 years	447	103	23.04
10 to 18 years	163	29	17.7
18 to 20 years	12	..	..
20 to 30 years	62	5	8.06
30 to 40 years	25	2	8.0
40 to 50 years	6	..	..

Of great importance too is the relation of the paralysis to antitoxin, and, as the following table shows, those injected on the first day of the disease were rarely paralyzed, and if so, the paralysis was very slight:

THE RELATION OF PARALYSIS TO DAY OF DISEASE ON WHICH ANTITOXIN WAS INJECTED.

Day of disease.	Total number of cases injected.	Paralysis cases.	Percentage.	Severe forms only.	Percentage.
First day	61	3	4.9	..	..
Second day	319	50	15.6	13	4.07
Third day	367	75	20.4	30	8.1
Fourth day	301	90	29.9	34	11.2
Fifth day	197	62	31.4	32	16.2
Sixth day	96	30	31.2	17	17.7
Seventh day and later	104	23	22.1	9	8.6
	1445	333			

The relative frequency of the various forms and the date of onset were also studied, and are very well illustrated in the following table:

SHOWING THE DATE OF ONSET AND FREQUENCY OF EACH FORM OF PARALYSIS.

Date of Onset.	Palatal.	Ciliary.	Squint.	Cardiac.	Labial.	Paraplegia.	Pharyngeal.	Diphtheritic.	Hemiplegia.
First week	19	..	..	21	..	..	..	..	..
Second week	71	..	..	34	..	..	..	..	..
Third week	51	7	10	..	..	..	..	..	..
Fourth week	28	69	8	..	..	..	..	..	1
Fifth week	21	60	11	..	6	..	3	1	..
Sixth week	29	24	11	..	13	..	7	2	..
Seventh week	9	5	14	..	12	..	11	..	..
Eighth week . . . . .	..	4	17	..	6	..	1	7	..
Total	228	169	71	55	37	31	22	10	1
Percentage frequency	15.2	11.2	4.7	3.6	2.4	2.06	1.4	0.6	0.06

By far the most frequent form is the paralysis of the palate, which rarely occurs before the third week, if one excepts those cases where there is involvement both of the palatal and cardiac muscles, and which may occur early in severe cases. In 55 of 58 cases in which the death was due to paralysis the cardiac muscles were involved, and this took place before the beginning of the third week. The cardiac, pharyngeal, and diaphragmatic palsies are the most serious, especially those beginning before the third week, and paralysis coming on after the third week usually recovers.

A very curious relation between the urticaria produced by the anti-toxin and the incidence of paralysis has been pointed out by Rolleston. He found that when there was a more or less general eruption the outlook as regards any subsequent trouble was very good, while in the cases which died of cardiac paralysis within the first three weeks there was either no rash at all or it was poorly developed.

He urges rest in bed as a prophylaxis, advising periods of from three weeks after a mild angina to a period of seven or eight weeks after a severe attack. He also suggests the use of adrenalin, giving by mouth 10 minims every two hours during the first ten days as a prophylactic, and he avoids the administration of brandy and strychnine by mouth or hypodermically during the acute stage. This method has also been tried and recommended by other observers, some of whom advocate the use of strychnine in addition.

THE EXAMINATION OF THE CEREBROSPINAL FLUID IN POST-DIPHTHERITIC PARALYSIS. Curiously enough, this subject has never been investigated, or, at least, very sparingly, although the question of the involvement of the nerve roots and cord and meninges have been studied by a number of different observers.

Roemheld¹ has made a study of this subject, but his report does not include a sufficient number of cases to draw any very definite conclusions as to its diagnostic value. He found considerable changes, however, in the fluid, consisting of a marked increase in albumin, and a somewhat less increase in the cells. The clinical condition of the patient and the changes in the cerebrospinal fluid went hand in hand, the fluid becoming normal as the symptoms disappeared, and it was only in exceptional cases where marked symptoms remained that the pathogenic condition of the fluid persisted. He called attention to the fact that where postdiphtheritic paralyses persist they probably do not depend upon a peripheral neuritis, but on the changes in the central nervous system. It would be interesting to have further studies to determine whether these changes are merely toxic in character or whether they are due to a true meningitic process.

¹ Deutsche medicinische Wochenschrift, April 15, 1909, p. 669.

ACTIVE IMMUNITY PRODUCED BY MIXTURES OF DIPHTHERIA TOXIN AND ANTITOXIN. Two years ago Theobald Smith¹ called attention to the fact that an active immunity may be produced in guinea-pigs by mixtures of diphtheria toxin and antitoxin. These produced no local disturbances during the life of the animal and no general disturbances, and this acquired immunity lasts at least two years.

This communication was in connection with the observations of the author that an actively immunized female parent may transmit antibodies to the immediate young who receiving the immunity passively soon lose it again. If the immunity was established passively, that is by the injection of antitoxin, it was not transmitted; but if it was actively acquired, as by the injection of the diphtheria toxin, it was.

Without going into the details of Smith's experiments, he seems to have demonstrated that by the injection of toxin and antitoxin mixtures an active immunity lasting several years can be produced in guinea-pigs, and that neither local nor general harmful effects are experienced. If there is sufficient toxin in the mixture to produce local lesions, the amount of active immunity is very large, greater than that obtained from neutral mixtures, and if the antitoxin is greatly in excess the amount of active immunity is small or may be absent altogether. The mixtures of toxin and antitoxin keep very well, and seem to be more efficacious at the end of forty-eight hours than at first, and may be kept without material change at an ordinary room temperature for five days. If this works out on the human being it will offer an easy and apparently safe method of producing a lasting immunity against diphtheria, but it will require careful experimentation to determine whether such mixtures apparently harmless in the guinea-pig would or would not produce local changes and even more severe symptoms in human beings.

Echinococcus Disease. THE SERUM DIAGNOSIS OF THE ECHINOCOCCUS. Working in the laboratory of Metchnikoff, Weinberg,² in connection with other observers, has determined that the Bordet-Gengou reaction may be applied to animals and also to human beings infected with the echinococcus. They found that the blood serum of people so affected contained specific antibodies which could only be united to the complement in the presence of hydatid liquid. They used the following products: The serum from the patient, the antigen (hydatid liquid), the complement of guinea-pig serum, the red corpuscles from the sheep, and the hemolytic serum from the sheep which had been rendered sensitive to echinococcus cyst fluid.

They employed two methods, one a rapid one, using the fresh serum of the patient, which, while less troublesome to perform, did not give as accurate results as a slower method, using the complement from a guinea-pig.

¹ Journal of Medical Research, 1907, p. 359.

² Annales de l'Institut Pasteur, June, 1909, p. 472.

In almost all cases the specific antibodies are present in sufficient quantity in persons affected with echinococcus to show this reaction, and the quantity of antibodies is greatly augmented after an operation for a hydatid cyst if the cyst is incised or torn. The amount present does not seem to depend upon the size of the cyst, but more upon its location and the structure of the cyst wall. By this means the suspected presence of a hydatid cyst may be definitely determined, as it gives much more reliable results than eosinophilia, which is wanting in a certain number of cases. It is more reliable than the precipitate diagnostic measures suggested by Fleig and Lisbonne. This latter reaction only occurs in about one-third of the cases, and other serums, normal or pathogenic, may give a like precipitation with hydatid liquid.

Intercurrent febrile diseases do not appear to have any influence on the specific antibodies of the serum of patients affected with the echinococcus. Following the removal of the cyst the reaction remains for a long time in case the cyst was incised or broken. If it is removed in its entirety the antibodies disappear rapidly from the serum.

The "Fourth" and the "Fifth" Disease.—The question of the existence of a hitherto unrecognized exanthem comes up every year with the reports of small epidemics of such diseases, and are always more or less interesting. It has only been in very recent times that the discussion as to the identity of chickenpox has about disappeared from medical literature, and the question of the identity of German measles occupied a prominent place for over a century. Probably no one now believes in the identity of chickenpox and smallpox, and no one doubts the existence of rubella unless it be some one whose experience has been very limited.

With those who have to do with infectious diseases of childhood it has long been an attractive theory that the disease described under the name of German measles is really two diseases, one resembling scarlet fever and one resembling measles, and some writers restrict the term rubella to those cases which resemble measles. Dukes, in July, 1900, published a paper in the *Lancet* describing an infectious disease which he called "The Fourth Disease." The period of incubation was about the same as that of German measles, nine to twenty-one days. Prodromes are usually absent, but malaise and some sore throat were sometimes present at the onset of the rash, which was followed by desquamation. Ker,¹ after a careful study, rendered the Scottish verdict of "not proven," which is very generally accepted.

The most recent contribution is by Watson,² who describes an epidemic of a disease occurring in Massachusetts, and for which he suggests the name of "Fifth Disease." This disease was first diagnosticated rubella,

¹ Practitioner, February, 1902, p. 135.

² Boston Medical and Surgical Journal, June 17, 1908, p. 780.

and by some physicians as mild scarlet fever, the chief point of difference being that the period of incubation was from seventeen to twenty-one days and that some of the cases who had had scarlet fever contracted this disease. The patients were not as ill as in scarlet fever, but otherwise the disease resembled scarlet fever in almost every particular. McCollom has always insisted that the incubation period in scarlet fever was from four to twenty days, with an average of from ten to fourteen days. Most observers place a very much shorter period, but it shows the possibility of the variable incubation period in this disease. As to persons having had scarlet fever and acquiring immunity it is always an open question, unless the diagnosis has been made by someone whose authority is beyond question, as there are so many rashes which may be wrongly called scarlet fever. As everyone knows, it is common experience to hear persons say that they have had scarlet fever three or four times, but such individuals have considerable difficulty in proving it.

From Watson's description one would be inclined to believe that he had to do with a mild epidemic of scarlet fever. As attractive as is the idea that there are two diseases, one resembling measles and one scarlet fever, it is not borne out by clinical experience, as one sees almost invariably in epidemics of German measles cases of the scarlatiniform type and also of the morbilliform type of the disease occurring side by side. Indeed, one of the most diagnostic features of the disease is the fact that the rash may take on this polymorphous character, and both characters of the rash may be present on different parts of the body of the same individual at the same time. Watson does not think the disease he described was the scarlatiniform type of rubella, or the "Fourth Disease," but an entirely new clinical entity. Future reports from him will be watched for with interest.

Glanders. *Human glanders* is probably not as rare as the mortality statistics would lead one to believe. Robin¹ has collected and analyzed 156 cases, and more recently Bernstein and Carling have reported 6 cases that have come under their observation. The one point in common in all their cases was the occupation bringing the individual more or less in direct connection with horses, and, wherever a patient is seen with a chronic lesion in the mucous membrane of the mouth and nose, or inflammatory masses in the subcutaneous or muscular tissues, glanders should be one of the diseases thought of.

The acute cases, as a rule, do not present any great difficulties in diagnosis, but the skin eruption has been mistaken for smallpox, chickenpox, impetigo, erythema nodosum, anthrax, and other conditions, while the fever has led to the opinion that the condition was typhoid, influenza, septicemia, acute rheumatism, and similar affections.

¹ British Medical Journal, February 6, 1909, p. 319.

The mallien test was used with good results, typical reactions following in each case, while no untoward results were produced in any cases that were not glanders. Animal inoculation is, however, the most reliable method of making the diagnosis, the method employed being to make an emulsion of the suspected tissue and inject subcutaneously into the abdomen of an adult male guinea-pig. It should not be injected into the peritoneum, as peritonitis caused by associated organisms may cause the death of the guinea-pig before the typical glanders reaction is produced. The reaction usually comes on in from seven to ten days, and occasionally may be delayed for several weeks. It is a good plan to inject a number of animals at the same time, as occasionally the test fails, probably because the bacilli are present in too few numbers. The characteristic reaction consists of an enlargement of the testes, with an acute inflammation of the tunica vaginalis. The bacterial diagnosis is liable to be exceedingly difficult, as the bacilli may be very scanty and are difficult to stain.

Bernstein and Carling found the most satisfactory stain to be carbolfuchsin violet, after treating the specimen with acetic acid. In cultures the appearance is very typical, and it is best grown by making smears from the unopened abscesses on glycerin agar and potato. On the agar the growth is marked in twenty-four hours, while on the potato it may be forty-eight hours before the appearance is typical. The agglutination test, as done at present, does not furnish perfectly reliable results.

Glandular Fever. In 1889 Pfeiffer called attention to an acute infectious disease affecting principally the cervical lymph nodes, and since that time other observers have reported epidemics of this affection. Burns¹ made a study of a small epidemic, and has brought out several interesting facts in connection with the disease.

In one case in which the period of incubation was determined it would seem it could be as short as twenty-four hours, as a child with the disease left the hospital and went home; it had not been seen by any member of the family for two and one-half months previously, and within twenty-four hours the mother had a typical attack of glandular fever. The incubation period is usually stated as being from seven to nine days.

In all the cases there was a leukocytosis varying from 18,800 to 26,400. Studies were made from cultures from the throat, and in every instance there was found to be infection of the pharynx and tonsils or a history of pharyngitis, and the staphylococcus aureus was found in every case in which the culture was taken.

It is curious to note in this connection that there was uniformly an increase in the small mononuclears both during and after the disease,

¹ Archives of Internal Medicine, August 15, 1909, p. 118.

while in pyogenic infections the blood usually shows an increase in the polymorphonuclear neutrophiles.

Influenza. INFLUENZAL MENINGITIS. Cohoe¹ reports a case of influenzal meningitis and has collected 24 other cases from the literature. There are also a large number of other cases in the literature the evidence of which is more or less unsatisfactory. Most of the cases reported have come to autopsy, and the lesions are more or less like those due to the meningococcus and pneumococcus. One interesting thing is the extreme variability in the localization of the lesions, and there is usually a diffuse meningitis, with an exudate which is sometimes thin and sometimes of a gelatinous consistency, and sometimes there is pus present. The cerebrospinal fluid is usually turbid, but at times it may be so clear and transparent as to suggest a meningitis of tuberculous origin. The sediment always contains large numbers of polymorphonuclear cells. The bacteria may be obtained from the cerebrospinal fluid first, by centrifugalizing and making smears which are best stained with a dilute (1 to 10) aqueous solution of carbol fuchsin. Cultures are best grown on pigeon blood agar.

The portal of entry of the influenzal bacillus has been much discussed, and it may go through the lymphatics of the nasal fossa and to the meninges from middle-ear disease and also from a general infection. The meningitis is usually secondary to a distinct lesion in some other part of the body. Adults are more or less immune, and over half the cases reported have occurred under one year of age, and almost all of the others under ten years. The symptoms are very much like those of cerebrospinal fever, and the duration of the disease is usually short in the cases which have recovered, the illness lasting from eleven days to six weeks. A positive diagnosis can only be made by means of a lumbar puncture and the finding of the organism in the cerebrospinal fluid. Another interesting report of this disease has been made by Davis.²

SEPTICEMIC CEREBROSPINAL MENINGITIS. Cohen³ has described at length a form of cerebrospinal meningitis, for which he proposes the name *la méningite cérébrospinale septicémique*, which is caused by a bacillus previously described by a number of authors who confused it with the bacillus of Pfeiffer.

Cohen, after his studies, believes that it is a separate microörganism. The meningitis is always accompanied by a generalized infection, and in many cases the microbe produces other lesions besides the meningitis, as purulent effusion of the various serous cavities.

The organism enters the body by way of the respiratory apparatus.

¹ American Journal of the Medical Sciences, January, 1909, p. 74.

² Archives of Internal Medicine, October 15, 1909, p. 323.

³ Annales de l'Institut Pasteur, April, 1909, p. 273.

Inoculation into guinea-pigs and rabbits produces a similar septicemia, with the same character of lesions as are found in man.

It is possible to vaccinate animals against this infection by injecting increasing quantities of cultures, and the serum of these animals possesses a considerable preventive power, so that it may be used to cure animals that have received a lethal dose of the cultures. The serum of animals vaccinated against the bacillus of Pfeiffer has neither curative nor preventive power. The organism resembles that of Pfeiffer very closely in its appearance and culture reactions, but they differ in regard to their bactericidal powers.

Kala Azar has been variously called tropical splenomegaly, dum-dum fever, etc. It has been studied by the English physicians in India for some years. It is an especial form of infection quite distinct from malaria, with which it is often confused, being characterized by irregular fever, progressive anemia, extreme emaciation, digestive disturbances, and considerable hypertrophy of the spleen and a slightly less hypertrophy of the liver, with also transitory edema. Less constantly there are hemorrhages from the mucous membranes, petechial eruptions, and a bronze discoloration of the skin, from which it derives its name of kala azar, or black fever.

Quinine does not affect the disease or the temperature, and the termination is nearly always fatal.

The cause of the disease was discovered by Leishman in 1903, and by Donovan in the same year, and the name of *Piroplasma donovani* has been given to the parasite, and later this name was changed to *Leishmania donovani*.

In 1904 Cathoire discovered a similar disturbance in the spleen of a French child, aged nine months, dying in Tunis, and since then the disease has been studied by Nicolle, who found that while he did not find kala azar in adults in Tunis, a careful study of children revealed an analogous disease of infants, to which he has given the name of *infantile kala azar*.¹

This disease exists in Tunis and very probably in southern Italy. It affects only young infants, generally during the second year, sometimes as early as five months of age and rarely in older children. Both the natives and Europeans are alike affected.

The disease begins insidiously, but later the symptoms are very characteristic, consisting of extreme pallor, emaciation, considerable hypertrophy of the spleen and a somewhat less hypertrophy of the liver, transient edema and pains, irregular temperature, marked acceleration of the pulse, disturbances of digestion, and a lymphocytosis. There are also hemorrhages from the mucous membranes and purpura. Death is the rule in almost all cases, although Nicolle believes that a cure is sometimes possible.

¹ Annales de l'Institut Pasteur, May and June, 1909.

At the beginning the diagnosis of the disease is difficult or impossible to make, but later when the characteristic symptoms appear the absence of the action of quinine makes the diagnosis plain. To render it absolutely certain it is necessary to search for the parasite, which is a protozoön belonging to the genus *Leishmania donovani* and morphologically resembling that of the ordinary kala azar. They have given the parasite the name of *Leishmania infantum*. In the peripheral blood it is found inconstantly, but may be recognized easily by a puncture of the liver or of the spleen. At autopsy the enormous spleen is found with enlargement of the liver and a red coloration of the bone marrow. The parasite may be found in enormous quantities in preparations from the spleen, liver, and bone marrow, and more rarely from other organs. They are sometimes free and sometimes in the large mononuclears. The only apparent difference in the disease is the age at which it occurs.

It was possible to grow the protozoön causing the infantile kala azar on appropriate media, and also to obtain cultures by reinoculating other tubes. It was also possible to reproduce the disease by inoculation of the virus into the dog or the monkey, other animals seeming to be very resistant.

The course in the monkey is very much like that in the human being, while in the dog it is very much more slow; 222 dogs caught in Tunis were examined and 4 found to be infected, and Nicolle is of the opinion that the disease passes from dog to dog and from the dog to the infant.

Histoplasmosis. Darling¹ has reported upon this disease, which is caused by a protozoön, the *Histoplasma capsulatum*, and which resembles somewhat the Leishman-Donovan bodies found in kala azar, and the disease itself is suggestive pathologically and clinically of kala azar. The organism differs from the Leishman-Donovan bodies in not having a chromatin rod and in the arrangement of its chromatin nucleus.

The discovery of the histoplasma bears out the prophecy of Manson, who once stated that kala azar or an analogous disease might be found in America. Darling has found this organism in three cases: two Martinique negroes, and the third a Chinese, the latter having lived in Panama for fifteen years. The symptoms are so closely allied to those of kala azar, which are noted above, that it is not necessary to repeat them. The organism is a small round or oval body, one to four mikrons in diameter, with a polymorphous, chromatin nucleus, and basophilic cytoplasm inclosed in a refractile capsule. The pathological features are the invasion of the endothelial cells of the smaller lymph- and bloodvessels and capillaries, with an enormous number of these organisms, and this leads to necrosis of the liver, enlargement

¹ Archives of Internal Medicine, September, 1908; and Journal of Experimental Medicine, 1909, No. 4.

of the spleen, pseudogranulomata of the lungs, small and large intestines, together with ulceration of the intestines and necrosis of the lymph nodes draining these areas.

This is another one of the brilliant discoveries of Darling, who is doing so much to elucidate the problem of tropical diseases in the canal zone.

Leprosy. The International Congress on Leprosy, held in August, at Bergen, Norway, was presided over by Dr. G. A. Hansen, and was attended by delegates from a great many different countries.

Notwithstanding the fact that leprosy has been studied for many years, there are a great many points yet to be settled. The first symptoms of the disease are not well known, nor the relation of leprosy to syringomyelia; likewise our knowledge of the treatment of the disease is far from satisfactory. Dr. Moreina, of Rio de Janeiro, spoke of the *psychoses of the lepers*. The mental conditions of the patients vary greatly, and those of the lepers in the far East differ materially from those of the Europeans. In the Asiatic asylums the lepers are usually contented and good-natured, while in the Europeans the condition is one of sadness and despondency. This may depend largely on the difference in the education of the people affected.

The subject of the *nastin treatment* was taken up, and Dr. von Deycke, of Hamburg, reported considerable improvement in a large percentage of lepers treated in this way, while other observers did not get satisfactory results. It would certainly seem that nastin is not a specific in any way and its use of very doubtful advantage. Nastin is a neutral fat obtained from cultures of a certain kind of streptothrix, and seems to be similar to the neutral fat which is obtained from the tubercle bacillus. Pure nastin is not used, but various degrees of concentration in combination with other substances, for example, benzoyl chloride in an oily solution.

As regards the condition of lepers in the United States, the official statistics from the United States Public Health and Marine Hospital Service, in 1902, stated that there were 278 lepers observed. Of these, 145 were born in the United States, the foreign born coming from sixteen different countries, chiefly Norway, China, Germany, and Bohemia; 107 cases were of the anesthetic variety, 88 tubercular, and in 56 there were mixed lesions. It would seem that if there are this many cases of the disease known, there must be a great many more unreported, as only one who is familiar with leprosy would be likely to recognize it unless it was very far advanced. The presence of pigmented spots which are anesthetic should always arouse suspicion and further investigation made of patients having such lesions. Considering the nature of the disease and experiences in past ages, it would seem the duty of the Government to at once establish a comfortable colony where all people affected could be removed and live under

suitable conditions. This is a problem for the National Government to solve and not one for State control, and recent experiences, as reported in the public press, concerning the hardships of people suffering with leprosy, also as to possible errors of diagnosis, render it all the more important that humane and scientific methods be instituted at once. It is reported that segregation in the Philippines has reduced the incidence of the disease by one-half.

Clegg¹ believes that he has been able to grow the leprosy bacillus by using an entirely new method, based on the belief that the *leprosy bacillus* obtains its nutrition from the products of tissue cells in the lesions. The ameba of dysentery was grown on a mixture of agar, sodium chloride, and beef extract. To secure the growth of the ameba the presence of the proper symbiotic bacteria is necessary. The plates containing the ameba were smeared with the pulp from the leper's spleen and incubated for six days at a temperature of 37° C. On staining preparations from these, large numbers of leprosy bacilli were found, and also short, plump, acid-fast bacilli. These were transplanted to other plates, and the acid-fast bacilli increased greatly in number. Whether the acid-fast bacilli are variations from the ordinary leprosy bacilli or not can only be determined through further study, as we have no knowledge whatever regarding the appearance of the leprosy bacilli growing on an artificial medium.

THE EXAMINATION OF THE NOSE IN LEPROSY. Brinckerhoff and Moore² have made some studies on the utility of the examination of the nose and nasal secretions for the detection of incipient cases of leprosy.

These studies were made in Hawaii, and they sought to determine especially two points: (1) Will the systematic examination of the nasal septum and nasal secretions reveal cases of leprosy which would pass undetected by other methods of examination? (2) When an early case of leprosy is under observation, can it be said that the case could have been detected by the examination of the nasal sputum and nasal secretions alone?

The importance of the nose in leprosy was brought into prominence by Sticker, in 1897, at the first International Lepra Conference. The results of Sticker, Plummert, and Falkao seem to show that the nose is often the site of a lesion discharging lepra bacilli in the earlier stages of the disease.

The methods of examination of the nose for leprosy are of considerable interest, and are given in full below:

I. Bacteriological examination of smears from the nasal secretion. Both sides of the septum and the bottom of the anterior cavity of the

¹ The Cultivation of the Lepre Bacillus. Philippine Journal of Science, Manila, April, 1909.

² Publication of the Public Health and Marine Hospital Service, 1909.

nose were carefully swabbed with a bit of sterile cotton wool twisted about the end of a sterile iron wire. The infected cotton was then used to make one or more smears on glass slides. New slides were used for each observation. The smears were fixed by heat and stained as follows:

1. Carbol fuchsin, steaming, one minute.
2. Wash in water.
3. Flood with a 3 per cent. solution of nitric acid in 70 per cent. alcohol, ten to twenty seconds.
4. Wash in water.
5. Counterstain with Löffler's alkaline methylene blue, dry, and examine with an oil immersion lens.

II. Inspection of nasal septum. Whenever possible the case was examined in direct sunlight, the alæ nasi having been dilated with a special speculum. In this way a clear view of the mucous membrane of the septum could be obtained. When sunlight was not available the usual head mirror or an electric speculum was employed.

III. Scraping from suspected septa. Whenever, in the course of the inspection of the septum, anything resembling an ulcer or a thickening of the mucous membrane over the septum was observed, the suspicious area was scraped with the point and edge of a rigid, spear-pointed, sterile platinum needle. The material obtained was used to make smears on slides which were examined by the same method as the smears of the nasal secretion.

The cases studied were in various homes and schools for children and the inmates of the territorial prison. Most of the previous studies that have been reported in the literature have been made upon lepers upon whom the disease has made considerable progress.

The observers conclude that the examinations do not reveal as many cases of leprosy as would have been expected from the statistical data had the method been an efficient one for establishing a diagnosis of the disease in the incipient stage. The examination of the nose and nasal secretions is not of dominant value in confirming the diagnosis of leprosy in the early stages of the disease. The conditions found in the noses of non-leprous children of non-leprous parents do not differ in important respects from those found in the descendants of non-lepers. They do believe, however, that the method is worth while even if it does not reveal all cases of the disease, and is of especial value when it is not possible to make a complete physical examination of people suspected of leprosy, and that where it is used it will lead to the recognition of the most dangerous types of the disease.

LEPROSY IN THE PHILIPPINE ISLANDS. Heiser¹ reviews briefly the work of the Government in segregating the cases of leprosy. He believes that there are in the Philippine Islands between 3500 and 4000 lepers.

¹ American Journal of the Medical Sciences, September, 1909, p. 367.

An attempt had been made at segregation by the Church under the Spanish regime and under the American occupation. In 1901 the island of Culion was chosen as a place for the leper colony, and in 1905 a systematic plan for the reduction of the number of cases on the Islands was begun.

The island of Culion is twenty by forty miles in size, located two hundred and forty miles from Manila. Most of the lepers are in the town of Culion, where they are kept at Government expense, but are allowed to make their own laws and to govern themselves. There is a large hospital in the town for the care of bedridden cases and for such others as care to undergo systematic treatment. The lepers are allowed to establish themselves at any place upon the island, and if they wish to engage themselves in agricultural pursuits, the animals and implements are furnished them by the Government.

A plan has been followed of trying to educate the people in regard to the dangers of leprosy, and they have started by removing all the leprous patients from the more or less isolated islands, most of which contained only a few victims, and looking over this territory later for new cases. By following this method a great amount of territory was freed in a short space of time. It has been shown by experience that after an island has been freed from lepers the people themselves may be intrusted to the care of preventing new cases from settling there.

Under the old system there were about 700 new cases of infection annually, but during the past year only about 300 cases have been found, a difference of about 57 per cent. In a campaign of this kind the early diagnosis is of the greatest possible value, and Heiser believes that the earliest and most common symptom is nasal ulceration situated on the nasal septum at the junction of the cartilaginous and bony portion. These were noted in 799 out of 1200 consecutive cases. It is interesting in this connection to note the opinion of Brinckerhoff and Moore, as stated above. In the 1200 consecutive cases 374 were of the anesthetic type, 157 of the tubercular type, and 650 were mixed cases.

A large number of different methods of treatment have been used, including potassium iodide, mercury, creasote, salicylic acid, chaulmoogra oil, gurgon oil, experimental sera, etc., but none of these have been found to have had any particular curative effect. In certain selected cases in the early stage of the tubercular type in young or otherwise healthy subjects the use of the *x*-rays has been found to be of considerable value.

THE SKIN REACTION OF LEPROSY. Mantoux¹ has reported before the Société de Médecine des Hôpitaux his experiences with *leproline*, which is a toxin of the bacillus of Hansen, which, when injected subcutaneously in persons affected with leprosy, produces effects analogous to those caused by the injection of tuberculin in the tuberculous.

¹ La Semaine Médicale, November 3, 1909, p. 526.

At the site of the injection in people affected with leprosy there is a small violet-red nodule surrounded by a slight erythema. At the end of about forty-eight hours the spot becomes purpuric and finally leaves a small scar, which persists for about two weeks. In people who are not affected with leprosy there is sometimes a slight redness, but no other sign.

THE COMPLEMENT BINDING IN LEPROSY WITH A SYPHILITIC ANTIGEN. Eliasberg¹ made a study of the serum reactions in cases of leprosy at the Riga Leprasarium, using the alcoholic liver extract from the liver of a child that had died of congenital syphilis. In 80.6 per cent. of the cases the complement binding took place. This fact is interesting in connection with the differential diagnosis of the two diseases, but does not detract from the great practical value of the Wassermann-Neisser-Bruck reaction. Eliasberg also noted—in fact, it has not been published before—that the serum of the leprosy patients very often alone in the proportion of 0.4 per cent. would inhibit hemolysis.

Malaria. Seale Harris² gives an account of the distribution of malaria which prevails in every State in the union except Wyoming, the greatest number of cases and deaths being reported from the Southern States and those near the Mississippi, Missouri, and Ohio Rivers.

Statistics compiled from the last census show that there died from malaria in the United States in the year 1900, 14,909 persons, distributed by States as follows:

Alabama	1055	Montana	5
Arizona	17	Nebraska	32
Arkansas	1730	Nevada	10
California	119	New Hampshire	18
Colorado	21	New Jersey	110
Connecticut	110	New Mexico	89
Delaware	19	New York	308
District of Columbia	63	North Carolina	527
Florida	366	North Dakota	4
Georgia	1011	Ohio	156
Idaho	4	Oklahoma	134
Illinois	497	Oregon	23
Indiana	340	Pennsylvania	140
Iowa	84	Rhode Island	24
Kansas	261	South Carolina	749
Kentucky	344	Tennessee	987
Louisiana	1030	Texas	1331
Maine	16	Utah	6
Maryland	131	Vermont	9
Massachusetts	70	Virginia	409
Michigan	168	Washington	13
Minnesota	9	West Virginia	34
Mississippi	983	Wisconsin	5
Missouri	965	Wyoming	0

¹ Deutsche medicinische Wochenschrift, November 4, 1909, p. 1922.

² The Prevention of Malaria, Journal of the American Medical Association, October 9, 1909, p. 1162.

Of those who died from malaria in 1909, 9320 were white and 5589 were colored. Harris states that malaria destroys more lives every year than all the epidemics of yellow fever in the last half century. He regards it as a much more serious disease than yellow fever, for the reason that one attack does not confer immunity, and also because it is considered as such a mild disease that it is often not properly treated. As a result, the chronic form appears to sap the vitality of the individual, and he is inclined to attribute the high death rate in the South from nephritis to chronic malaria. He calls attention to the fact that malaria played a large part in the decadence and downfall of both ancient Greece and Rome. He also cites the first capital of Alabama, St. Stephens, which was abandoned on account of the prevalence of malaria.

Wolbert states that in 1901 one person in every seven residing at the army posts had malaria some time during the year, and, according to the statistics from railway hospitals, one railway employee out of every four had malaria. Wolbert estimates the annual deaths in Texas from malaria at about 3000.

Harris believes that the following methods should be used to prevent malaria:

1. That the infected individual, just as in a case of yellow fever, should be isolated in a mosquito net or in a screened room to prevent his infecting the anopheles mosquitoes. The mosquitoes in the house should all be destroyed. That persons in the house or others exposed to the bites of infected mosquitoes should take quinine, 3 grains night and morning, and that the patient after he has been relieved of all symptoms should take 6 grains of quinine a day for a period of at least three months.

2. That malaria should be a reportable disease.

3. That efforts should be made to destroy all anopheles mosquitoes and their breeding places.

4. That when it is not possible to destroy all mosquitoes in any community, every person should sleep in screened rooms, or under mosquito nets, from early spring until the mosquitoes are destroyed by the frosts of winter.

5. That in badly infected communities every person should take prophylactic doses of quinine during the summer and autumn months.

6. That there should be a systematic campaign of education.

7. That there should be organized a national association for the study and prevention of malaria, as was done in Italy.

8. That the medical societies and boards of health, the American Medical Association, and the United States Public Health and Marine Hospital Service should all get together and take up the work of stamping out malaria.

9. That Congress should create a special commission for the prevention of malaria and provide an appropriation for carrying on the work.

Price, Secretary of the State Board of Health of Maryland, in discussing Harris' paper, was inclined to believe that many of the deaths reported as due to malaria were typhoid. While this is probably true, malaria can still be regarded as a very formidable disease and one which can be entirely eradicated, as has been shown by experiences in Havana and Panama, a lesson which every locality where there is malaria should take to heart.

CONGENITAL MALARIA. Dumolard and Viallet¹ have reported a case which would seem to prove that congenital malaria is a possibility, although this has been previously denied by most of the physicians who have studied the subject.

The case occurred in Algeria, and was that of a woman admitted to the hospital in the seventh month of pregnancy. She had been in good health until four days before admission, when she had a severe attack of malaria. The child was born a few days later and lived only an hour, and the malarial parasite was obtained from the blood of the umbilical cord, from the heart of the fetus, and from the placenta.

THE TREATMENT OF MALARIA WITH ATOXYL. Georgopulos² treated 14 cases of malaria with 2.5 c.c. of a 20 per cent. solution of atoxyl, using this quantity three times in six days, and then once every three days for three more injections. The fever disappeared, the spleen became smaller, the malarial parasite disappeared from the blood, and the general condition became improved. The effect of the arsenic, however, was to produce colicky pains, diarrhea, and an unpleasant sensation in the throat. It is, of course, interesting to know that arsenic will kill the malaria parasite in the human body, but it would seem to be more profitable for the human race if the attention of investigators were turned more particularly toward diseases for which we do not already possess a specific.

PLASMODIUM CARRIERS. Dealde, in order to determine whether there were plasmodium carriers similar to typhoid and diphtheria carriers, made a study of 124 aspirants for military service for the Dutch East Indies. For the most part these were soldiers who had lived somewhat in the tropics. In 10 of these who were perfectly healthy there were found parasites of malaria. This is an important advance in our knowledge of plasmodial diseases, as these individuals, otherwise perfectly healthy, might act as a source of infection for mosquitoes and endanger the health of other individuals at the same military post.

Malta Fever. While Malta fever is never present in America except when it is imported, several cases have been found by various observers in sailors and travellers, and this is one of the possibilities which one must consider in making the diagnosis of any continued fever. It

¹ Bull. et mém. Soc. méd. d. hôp. de Paris, 1909, 3 s., xxvi, p. 229.

² Munchener medicinische Wochenschrift, 1908, p. 615.

is most likely to be confused with malaria or typhoid. It has an irregular course, a curious undulating temperature, and there is enlarged spleen, pains in the muscles, and the joints may be inflamed.

The *Micrococcus melitensis*, discovered by Bruce, is the cause of the disease. This organism is found in the spleen in large numbers, and it is pathogenic for monkeys, and there have been instances of accidental laboratory infections in man.

Trulli¹ reports two cases, together with some studies of the nature of the disease.

Four different types of temperature may be met with: (1) The continued remittent form, ending with an intermittent period; (2) the continued remittent form with an intermittent period at the beginning and at the end of the disease; (3) a continued remittent form with an undulating temperature sometimes periodically intermittent; and (4) numerous variations of the temperature in twenty-four hours.

As to the method by which the disease is transmitted there is still some question. Some believe that it enters the respiratory apparatus in infected dust, others that it is transmitted by means of goat's milk entering through the digestive tract, still others that it is possible for it to be transmitted through mosquitoes, and Donzello has isolated the micrococcus from the intestinal canal of infected flies. In a case reported by Strong the portal of entry was the conjunctiva in one of the laboratory infections.

Palumbo² has confirmed the observations of Shaw, Horrocks, and Signer that goats may be experimentally infected with the micrococcus of Malta fever, but he has not seen any cases where the goat was infected spontaneously. He regards the milk reaction of Zammit as a safe method of making the diagnosis, but this may be confirmed by using Wright's serum reaction—the method in either case being to use milk or serum to produce agglutination of cultures.

Measles. EPITHELIAL CELL CHANGES IN MEASLES. It is rather curious that so few studies have been made upon the skin changes in measles. There are scarcely any reports that have been made on this subject, but one of the best studies was that of Catrin, who in 1900 made a careful study of a case coming to autopsy on the fourth day at the height of the eruption.

Ewing³ studied the skin from 9 cases and found that there are at least three rather distinct series of histological lesions. These consist in focal necrosis with the formation of small vesicles, isolated necrotic epithelia, diffuse perinuclear vacuolation of cells of the epidermis and of the dermal glandular structures, with congestion, edema, swelling,

¹ Il Policlinico, August 8, 1909, p. 997.

² Ibid., August 29, 1909, p. 1094.

³ Journal of the Infectious Diseases, February, 1909, p. 1.

proliferation of the endothelial cells, and a moderate increase of the large round cells.

In a case of hemorrhagic measles the focal necrosis was wanting, but the other lesions were present, and, in addition, in the vacuoles of the epithelium, in and about the capillaries and lymph spaces, were very large numbers of peculiar granules or ring-shaped structures. The nature of these bodies was not determined, but they are probably coagulated albuminous material from the blood or degenerative epithelium. In another case, one of confluent measles, there were hyperkeratosis and a peculiar form of degeneration of the Malpighian cells.

Milk Sickness. Jordan and Harris¹ have made a study of the milk sickness, or *trembles*, a disease which has been studied before, especially in cattle, and which is characterized by a faltering gait and a certain restlessness and trembling, which has given rise to the popular name trembles; and this later stage passes into a second stage of great weakness and exhaustion. Death usually follows, although some cases recover.

Milk sickness may affect man either as an acute or chronic condition. In the acute form there is nausea and vomiting, great prostration and clammy skin, an extremely anxious countenance, and constipation. There may be pains in the head and arms and legs. In the more chronic forms the individual is languid and unable to make any exertion of body or mind, has a capricious appetite, some nausea, palpitation of the heart, and a certain amount of stiffness and trembling of the extremities. In the severer forms there is a peculiar odor of the patient's breath, which has been variously described as sweetish, like chloroform, due to acetone. The disease in man is sometimes fatal. Dogs, sheep, and other animals may be affected by this disease.

One of the characteristic features is a tendency to relapse, and the subacute forms of the disease may be transformed into the acute form by long fatigue, fasting, or overexertion, and in some instances by allowing the bowels to remain constipated for some days. The mortality apparently varies from time to time, and in different outbreaks, but averaging a series of 318 cases, there were 75 deaths, or a mortality of 20 to 25 per cent.

The disease has prevailed in the central Western States for over one hundred years, and occasionally occurs at the present time in North and South Carolina, Kentucky, Tennessee, Ohio, Indiana, Michigan, Texas, and New Mexico. The number of cases have been reduced by the discovery that certain tracts of land were concerned in the production of the disease, and that clearing, drainage, and cultivation would remove the danger. Such land has also at times been fenced off from adjoining pastures known to be harmless.

¹ Journal of Infectious Diseases, September, 1909, p. 401.

The disease is usually contracted by cattle or sheep grazing in the infected territory, and is communicated to man usually by means of milk or butter, and sometimes by insufficiently cooked meat. Water may also be a source of the disease both in man and in animals.

The chief lesions are a marked, fatty degeneration of the liver, and cloudy swelling, or fatty degeneration, of the kidneys. The disease has been thought to be due to poisonous plants, to mineral poisons, and more recently to bacteria.

Jordan and Harris have succeeded in isolating an aërobic spore-bearing bacillus easily grown on ordinary culture media, and they have called this the *Bacillus lactimorbi*. They found this in the internal organs and heart blood in animals examined a few hours after death. It has been found in milk and butter suspected of having communicated the disease, and also in the feces of several non-fatal human cases. They were also found in the soil of milk-sick regions. On rabbits or guinea-pigs this organism has little effect, but fed to dogs or cats in considerable quantities, it produces symptoms similar to milk sickness. In calves and horses the feeding results were not conclusive. They are not certain that this organism is the cause of milk sickness. It is possible that under certain favorable conditions the bacillus possesses a pathogenic and toxigenic character which may be lost under artificial culture.

Plague. THE SUSCEPTIBILITY OF ANIMALS TO PLAGUE. McCoy¹ experimenting with gophers, field mice, and ground squirrels, found that the gophers were resistant to plague when inoculated by the cutaneous method, but often susceptible when inoculated subcutaneously. He did not regard gophers as a source of danger during epidemics. Field mice were found to be moderately susceptible to cutaneous inoculation and quite susceptible to subcutaneous inoculation. They are probably as susceptible as rats, but as they rarely come in close contact with man it is not probable that they will ever be a serious factor in spreading an epidemic. The ground squirrels were found to be highly susceptible to plague infection, and, as is already well known from experiences in California, this animal may be of great importance in spreading the disease. McCoy also found that there was considerable immunity to plague among the wild rats of San Francisco, the percentage being especially high among old rats.

Pneumonia. There have been the usual number of articles published during the past year on the subject of pneumonia, but most of them deal with points which have already been thoroughly discussed, or with reviews of series of cases with reference to the occurrence of certain symptoms and complications. There have been no great advances made in any direction with this disease. Vaccines have been tried, and the results were noted under the heading of vaccine therapy. Among the more important articles are those which are reviewed below.

¹ Journal of Infectious Diseases, June, 1909, p. 283.

PNEUMONIA IN THE AGED. Elsner¹ has given a short but interesting account of his experience with pneumonia in old people. In 1898 he reported 150 cases of pneumonia, 14 of which were over fifty years of age. Of these, 4 were between fifty-one and fifty-five, 2 between fifty-six and sixty, 3 between sixty-one and sixty-five, 2 between sixty-six and seventy, 1 between seventy-one and seventy-five, and 2 over seventy-five.

In the aged various organs of the body seem to become more independent of one another, and there may be very serious lesions with few or no symptoms, so that very often there may be a very marked pneumonia and nothing to call attention to it until the patient dies rather suddenly while going about his usual routine.

The disease often comes on without a chill, and there are no symptoms to mark the time of the beginning of the pathological changes. In this, the pneumonia of the aged resembles that of infancy. A very large proportion of the cases are bronchial pneumonia, and the organism chiefly associated with this form is the streptococcus. The cases of bronchial pneumonia which come on suddenly with marked symptoms, and also the cases of lobar pneumonia, have the pneumococcus associated with them. Dilatation of the heart is a very frequent complication, and in some cases may be merely an aggravation of an already-existing lesion. In a certain number of cases there may be no fever whatever, a point of very considerable clinical importance.

COMPLICATIONS OF PNEUMONIA. Fussell² has called attention to some of the complications which he has met with in pneumonia, and in practically all cases in which there is any very serious amount of constitutional disturbance an examination of the urine will reveal albumin and casts. It is a good plan to examine the urine frequently in order to be able to meet this complication promptly should it arise. There is always more or less disturbance of digestion, and there is liable to be abdominal distention due to the formation of gases in the stomach and intestine, and also to weakness of the intestinal muscles. This causes pressure upon the diaphragm, which interferes markedly with the already overburdened heart and lungs, and is to be regarded as a more or less serious complication, and one that should meet with prompt treatment. This consists in proper diet, which should consist of milk or some modification of it, if it is well borne, and egg albumin if it is not. Other food may be allowed if it is well borne, as patients differ very greatly in their ability to take food without the production of gas. Fussell suggests the use of salol, and sodium bicarbonate either in combination or alone.

Middle-ear disease is not uncommon and may be overlooked in young children and patients who are unconscious. The ear should be examined

¹ New York State Journal of Medicine, February, 1909, p. 34.

² American Journal of the Medical Sciences, January, 1909, p. 67.

from time to time in order to see whether or not this complication is present, and to institute prompt treatment if it should be discovered.

Cardiac dilatation is frequently met with in the aged and drunkards and individuals weakened by disease, and in a small proportion of cases pericarditis and endocarditis may be present. Both of these may be easily overlooked.

Arthritis is a rare complication and one which may be occasionally met with, and a marked *cyanosis of the extremities*, even with gangrene, has been described.

EMPHYEMA AND DELAYED RESOLUTION IN LOBAR PNEUMONIA. McCrae¹ has made a study of the cases of delayed resolution and empyema occurring in the medical service at the Johns Hopkins Hospital. During the period of eighteen years there were 805 cases of pneumonia, among these, 29 cases of empyema (3.06 per cent.) and 30 of delayed resolution (3.07 per cent.), the incidence of the two conditions being about equal.

As regards the empyema, McCrae regards it rather as a complication than a sequel, and it occurs relatively much more often in the colored than in the white race, and the only ordinary manifestation present in every case is fever. The physical signs are extremely variable, and not too much dependence can be placed upon them in making the diagnosis. It is well to bear in mind that vocal fremitus may be retained, even when there is a considerable amount of exudate present.

McCrae's cases did not include very many children, but one should emphasize the point that there are even greater variations in the physical signs of empyema in early life. The changes in the breath and voice sounds are probably of greater service in making the diagnosis than any other sign. In all doubtful cases puncture should be done to clear up the question, and if necessary this may be done several times; the procedure is without danger if done with ordinary aseptic precautions.

In regard to the delayed resolution none of the factors usually considered to be of importance effecting its occurrence seems to have any influence. The cases do not bear any special relation to involvement of the apices, old age, general debility, or cachexia. Three-fourths of the cases were between the ages of seventeen and forty years. There is relatively a higher incidence of the negroes as compared to the white race, and the lower right lobe is most frequently involved. The physical signs show great variations, and it is impossible to give any satisfactory general description. As a rule, the diagnosis is extremely difficult, and can only remain by the exclusion of other possibilities, the greatest trouble being to exclude empyema and tuberculous pneumonia. Empyema is perhaps best excluded by the use of the needle, and if there is

¹ Montreal Medical Journal, July, 1909, p. 423; also Johns Hopkins Hospital Reports, 1909.

an absence of leukocytosis it is taken as a pointed evidence of the existence of empyema. In tuberculous pneumonia the sputum should be examined frequently, and persistent negative findings day after day, while not at all conclusive, is one of the most useful points in excluding the tuberculous process. As a general rule, the cases are not dangerous, but it is never safe to make predictions beforehand as to what will happen in any given case, as permanent changes may take place in the lung in a very short space of time.

In regard to the treatment of delayed resolution, the greatest help is the use of the x -rays, as suggested by Edsall some years ago. They should only be used after all signs of inflammatory progress have disappeared, and it is exceedingly important to exclude tuberculous pneumonia, as exposure of the tuberculous lungs to the x -rays is a dangerous proceeding. Usually four exposures of four or five minutes each given on alternate days will suffice.

An Epidemic of Empyema. A short but very interesting report of what we have all seen from time to time has been made by E. H. Musson,¹ of Norborne, Mo. For a period of six months, in a rural community, he treated 14 cases of pneumonia, 8 of which were complicated by an empyema, and in all these 8 cases the symptoms were those of a severe pleuritis with very little to suggest pneumonia. This tendency of pneumonia at times to be complicated with empyema has been noted in epidemics in institutions and also in towns, and no very satisfactory explanation has ever been advanced why it should occur in some epidemics of pneumonia and not in others.

POSTOPERATIVE PULMONARY COMPLICATIONS. Homans² has collected some rather interesting figures bearing on this subject. There are such variations, however, and the question of how far the administration of an anesthetic by inhalation is responsible for the pulmonary complication must be more thoroughly studied and an inquiry made as to whether there are any other factors of etiological importance. The practical question is as to whether or not greater care in the administration of the anesthetic will not lead to a diminution of lung complications.

Homans classifies these cases into three groups: (1) Cases depending on narcosis, variously known as inhalation, aspiration, or ether pneumonia characterized by a general bronchial pneumonia, the process coming on early and lasting but a short time. (2) The cases of stasis in the lungs known as hypostatic pneumonia. It is sometimes difficult to separate these from the first or third classes and they are caused by a feeble circulation and inability to keep the lungs clear. (3) Cases depending on embolism. These may be due to the process starting

¹ Journal of the American Medical Association, August 14, 1909, p. 529.

² Johns Hopkins Hospital Bulletin, April, 1909, p. 125.

in the veins, and it has been supposed that the process may also start in the lymph vessels. The disease resembles the lobar type of pneumonia.

The following figures of von Lichtenberg are of interest:

	No. of laparotomies.	Mortality due to lung complications. Per cent.
Körte (Bibergeil)	3909	3.5
Czerny	1302	3.9
Von Angerer (Gebele)	1196	6.43
Kümmell (Grimm)	1754	2.5
Von Mikulicz (Henle)	1787	8.0
Von Mikulicz (Kausch)	1881	2.4
Krönlein	1409	0.56
Trendelenburg (Läwen)	1829	5.4
Lexer (Wolff)	976	12.5

With the exception of operations about the mouth and throat, lung complications are more liable to follow abdominal operations, especially those upon the stomach, and the highest proportion is furnished by operations upon the stomach for cancer. The following table shows the relation of the complication to the various operations:

Operations.	No. of cases.	Died. Per cent.	Died of lung complications. Per cent.	Percentage of all deaths due to lung complica- tions.
Stomach	2176	623 (28.63)	181 (8.31)	29.05
Bile passages	1042	132 (12.66)	20 (1.92)	15.15
Herniæ	1601	60 (3.74)	15 (0.93)	25.00
Goitre	3526	34 (0.96)	15 (0.42)	44.00
Gynecological	3280	257 (7.83)	50 (1.53)	19.45

The question has been studied from the standpoint of local anesthesia, and it has been found that pulmonary complications are as frequent with cocaine as they are with general anesthesia, but the mortality from the former is distinctly lower. The subject is one which is deserving of further study, particularly in the clinics, where careful records have been kept of the nature of the operation, the anesthetic used, and the postoperative complications.

DRUGS IN THE TREATMENT OF PNEUMONIA. Among the drugs that have been suggested as being of particular value in pneumonia are the salicyl derivatives. The salicylate of soda was formerly recommended by various clinicians, but the difficulty of administering it in sufficient doses led to its abandonment.

Andrews¹ suggests the use of *acetyl salicylic acid*, as it is better borne than the other preparations and seldom produces any gastric disturbance except in patients suffering with hyperacidity. Ordinarily about 40 grains a day are given in four doses of 10 grains each. Following the administration of the drug there is a certain amount of perspiration, reduction of the temperature and of the pulse rate, and improvement in the respiration, and in cases where the temperature is not reduced very much the patients are rendered more comfortable. Andrews does not claim that the course of the disease is shortened by the drug, although he thinks that this is possible, but he does believe that under its use the patients are very much more comfortable than without it.

This is very much like the results obtained from the administration of quinine in large doses, and while one must doubt whether quinine actually reduces the duration of the disease, there can be no question about the fact that patients with marked toxemia and high temperature and all sorts of unfavorable symptoms do have a lessening of these after the administration of full doses of the drug, a point which is worth bearing in mind, as by its use many patients may be made very comfortable even if the disease is not cut short, and the same thing is true, though perhaps to a less degree, of guaiacol carbonate.

Seibert,² suggests the use of *camphor* given hypodermically. Until very recently camphor has been used only as a heart stimulant and its use has been more or less limited to the German clinics. Seibert suggests using very large doses (as much as 12 c.c.) of a 20 per cent. camphor oil, repeating this dose every twelve hours. In a series of 21 cases there were no deaths. The series is, however, too small to place any opinion upon, and the dose used would seem to be very large, although Seibert claims to have had no bad results.

Anterior Poliomyelitis. There have been a number of recent contributions to the study of epidemics of this disease, among which may be mentioned the reports of Holt and Bartlett, of Starr, and of Lovett, and so far no light has been thrown upon the causative agent. A more recent contribution is the study by Lovett³ and Emerson⁴ of the occurrence of infantile paralysis in Massachusetts in 1908. They briefly summarize the nine epidemics occurring in various places in the United States in 1907 and 1908, and report in detail the occurrence of an epidemic in Massachusetts which consisted of 136 cases, nearly half the number of the previous year.

While the distribution of cerebrospinal meningitis was practically the same in 1907 and 1908, the grouping of the cases of infantile paralysis was entirely different in 1908 from the cases reported in 1907. The

¹ American Medicine, November, 1909, p. 572.

² Münchener medicinische Wochenschrift, September 7, 1909.

³ Boston Medical and Surgical Journal, 1909, v. 161, p. 112.

⁴ Ibid., p. 115.

largest number of cases occurred between the ages of one and two years, but there were two adult cases reported, one twenty-one and one forty.

The symptoms reported were: Fever in 54 cases, in 1 case there was no fever; brain symptoms occurred in 15 of the cases, and there was usually delirium during the febrile state. There was vomiting in 21, constipation in 20, and diarrhea in 8. Retraction of the head was present in 10 cases, there was pain reported in 46 cases and absent in 2, and the pain was usually along the distribution of the paralysis, and, as a rule, did not subside until after the acute attack. In most instances the paralysis came on two or three days after the onset of the fever, but in some cases it was a week or ten days and even two weeks later. Seven of the cases are said to have recovered completely, 1 five days from the beginning of the disease, 1 ten days, 3 in two weeks, 1 in six weeks, and 1 in three months; 4 cases terminated fatally.

Lovett and Emerson conclude that infantile paralysis is produced by some external agent, that is, it is an infectious disease and is but mildly contagious at the most, and they are inclined to believe that the harmful agent enters the digestive tract in most instances. In many of the cases the only connection between the families where infection occurred was that they purchased some of their food supplies from pedler's carts.

The diagnosis in some cases led to difficulty. In 1 case no diagnosis was made, in 2 the disease was supposed to be typhoid fever at first, and the following diagnosis was made in single cases: Digestive disturbance, heat-stroke, cerebrospinal meningitis, and rheumatism.

By far the most important contribution to this subject for many years are the results of animal inoculation obtained by Flexner and Lewis.¹

Earlier in the year, Landsteiner and Popper,² of Vienna, succeeded in producing the disease in monkeys by inoculation by using parts of the spinal cord from a typical case of anterior poliomyelitis which had died the fourth day of the disease. The injections were made into the abdominal cavity of rabbits, guinea-pigs, mice, and two monkeys. In the smaller animals there was no paralysis, and there were no changes in the spinal cords. Typical changes of anterior poliomyelitis were found in one monkey, which became ill on the sixth day after inoculation and died on the eighth. It was not known whether there was any loss of power or not. The second monkey developed total paralysis of his hind legs on the seventeenth day; he was killed on the nineteenth day, and typical changes were found in his nervous system. Inoculations from the spinal cord from this monkey into others were negative.

¹ Journal of the American Medical Association, November 13, 1909, p. 1639; and November 23, 1909, p. 1913.

² Zeitschrift f. Immunitätsforschung und experimentelle Therapie, 1909, Band ii, Heft 4, Teil 1.

Flexner and Lewis succeeded in transferring the disease by inoculating emulsions of the cord of children who had died from the disease, and also succeeded in transmitting the disease to other monkeys from those animals developing paralysis. They have succeeded in passing it through a series of eight monkeys, and are undoubtedly transferring the virus of the disease from one animal to the other without much difficulty. It is not absolutely essential that the virus be introduced into the spine, as successful transmission is possible by way of the peritoneal cavity by intravascular injection and intraneural injection. In the monkey in which the virus was introduced into the sheath of the sciatic nerve the paralysis developed first on the side inoculated and later extended to the opposite side of the cord. There may, however, be other avenues of entrance, and additional observations are being made to determine whether infection may occur by way of the skin, the respiratory passages, and digestive tract.

In monkeys this disease is very severe and often fatal, and when recovery takes place paralyses are left similar to those found in children. This is by far the most important contribution which has been made to the study of this formidable disease. It is hoped that further study will give a greater knowledge of the nature of the virus.

In the report of the Massachusetts cases there were many instances of animals being affected during epidemics, horses, pigs, dogs, and chickens all having been paralyzed. Recently, in Massachusetts, a mother and daughter were paralyzed after an epidemic of "leg weakness" in the chickens of the household.

Dr. Theobald Smith, pathologist to the State Board of Health of Massachusetts, has recently undertaken a study of the feces of patients suffering with the disease, as there is an opinion held by some that the toxic agent or virus enters through the gastro-intestinal tract. It would seem only proper that the State Boards of Health everywhere should study the occurrence of this disease, and in some States there is already a law or a Health Board rule that all cases be promptly reported to the proper authorities. This would seem to be a step in the right direction, and it is almost inconceivable why it has not been followed by every State in the Union.

Rabies. Kerr and Stimson, of the Public Health and Marine Hospital Service, have made a most interesting report upon the prevalence of rabies in the United States.¹ Rabies has been endemic in the United States for more than one hundred years, the first outbreak being reported in Boston in 1768. It appeared in Philadelphia in 1779, and was apparently prevalent throughout the Northern States in 1785, and was soon after reported from the southern part of the country. There has been considerable variation in the prevalence of rabies both in man

¹ Journal of the American Medical Association, September 25, 1909, p. 989.

and in animals from decade to decade, and the mortality apparently varies greatly from year to year. A detailed study of the distribution of rabies has been undertaken by the United States Public Health and Marine Hospital Service, and an effort has been made to secure information of all reported cases.

Salmon, in 1900, made an extensive investigation of the prevalence of the disease and reported 230 deaths among human beings in seventy-three of the principal cities of the United States from 1890 to 1899. He reports the existence of the disease in man or animals in the twenty-five States as follows:

Alabama,	Maine,	Ohio,
Colorado,	Maryland,	Oklahoma,
Delaware,	Massachusetts,	Pennsylvania,
Illinois,	Minnesota,	South Dakota,
Indiana,	Missouri (?),	Tennessee,
Iowa,	Montana,	West Virginia,
Kansas,	Nebraska,	Wisconsin,
Louisiana,	New York,	Wyoming.
	North Carolina,	

The mortality statistics, if available, would give a fairly accurate idea of the geographical distribution of the disease, as rabies in the human being is always fatal.

The registration area, from 1900 to 1907, comprised fifteen States, the District of Columbia, and seventy-eight cities with an estimated population of about 41,000,000, the total estimated population of the country being about 84,000,000 during that year. In this registration area there were, in 1906, 85 deaths, 66 being reported in cities and 19 from rural districts. In 1900 there were only 33 deaths in the same area.

The most striking feature brought out by the investigation was the general distribution of the disease through the eastern part of the country and its almost complete absence in the extreme western part, especially the Rocky Mountains and Pacific Coast. But these Western States, while apparently exempt in 1908, previously had the disease reported as affecting various animals, such as dogs, cats, wolves, horses, cattle, sheep, hogs, squirrels, and skunks.

The facilities for giving any treatment in the United States is fairly adequate, for about 1500 persons received the treatment in 1908 in twenty institutions located in nineteen States, twelve of these being under the auspices of boards of health. Some of the Pasteur Institutes now send the treatment by mail, and the attending physician is thus able to give the treatment at the patient's own home.

The extinction of rabies in the United States will probably be a most difficult matter, but the results of the effective legislation in England should be borne in mind in discussing this problem.

The experience in that country is particularly instructive, as in 1892 there were but 38 rabid dogs reported, and as there was a petition against the muzzling of dogs brought forward by lovers of animals, owing to this the dogs were allowed to go about without restraint. The result was that during five years 1602 dogs and 51 people died of rabies. This led to an act of a strict muzzling law, which remains in force in spite of a petition signed by 50,000 people, and since 1903 there have been no cases of rabies reported in England. The muzzles have been removed from the dogs, but will be returned should a case of rabies be reported. In all infected areas there should be prompt destruction of all animals affected and the proper muzzling of all dogs.

The suppression of rabies in man can only be effectively carried out by preventing the disease among animals. It is probable that in a large number of cases of rabies the diagnosis is not made, for while it is rather a typical disease to one who is familiar with it, it may easily escape recognition by even skilled diagnosticians unless their minds are directed toward the disease. I remember one instance of a small boy being sent to an institution for acute mania. A number of competent physicians saw the case, which was afterward properly diagnosed by a physician familiar with rabies.

It is interesting to note that Remlinger¹ has been able to transmit rabies from monkeys by ingestion not only by using certain fixed viruses especially adapted to the organism of monkeys, but also the ordinary intensified street virus such as is usually found in the antirabic institutes. It is possible therefore that monkeys may contract rabies not only when bitten by a rabid animal, but on eating the virulent parts of a cadaver of an animal who has died of hydrophobia.

Ever since the subject of hydrophobia has been generally discussed the rarity of the disease among the dogs of Constantinople has been a question of considerable comment. Remlinger² has found that the street dogs of Constantinople do not resist inoculations of the rabies virus any better than any other variety of dogs, and that cases of furious rabies are twice as numerous there as the paralytic cases, a greater proportion than that observed in Paris.

The virus taken from dogs in Constantinople he found to be of unusual virulence, killing rabbits by subdural inoculation after an incubation period of about twelve days. He is inclined to believe that the rarity of hydrophobia is explained by the curious customs of the street dogs in Constantinople. They inhabit small sections of the street, most of the dogs remaining during their entire life in the zone in which they are born. They rarely trespass neighboring quarters on account of the serious fights which take place with strange dogs. They also

¹ Comptes rendus Société Biologie, October, 1908, p. 385.

² Bulletin Société méd. Vét., April 30, 1909, p. 137.

have a very strong instinct in avoiding rabid animals, only the very young dogs being willing to approach one affected.

Relapsing Fever. The study of the diseases of the Isthmus of Panama continues to be carried out in a most satisfactory way, and the latest contribution is Darling's study of relapsing fever.¹

Relapsing fever has been reported from time to time in the canal zone ever since the American occupation in 1904. It occurs chiefly in white laborers of various nationalities, and the diagnosis has been made by blood examinations.

Relapsing fever has been observed in many parts of the world, and cases have been noted in various parts of the United States, a few cases having occurred in Washington, Maryland, New Jersey, and Connecticut, and occasionally isolated cases have been observed in sailors or immigrants. The disease has been noted in various European countries, and the spirochete which is its cause was first described by Obermeier. Since that time spirochetæ have been found to be associated with many different diseases, and it also has been found that insects of various varieties may harbor them. It is impossible to differentiate the varieties of the spirochetæ of recurring fever by cultures, nor does their morphology offer an accurate means of distinguishing them. In the Panama relapsing fever spirochetæ were found belonging to the same group as the above, and it was found that monkeys and white mice could be infected and a similar recurring fever be produced, while only single paroxysms occurred in white and wild rats.

The spirochete in question is probably a spiral ribbon and not a spiral cylinder, and there are considerable variations in the size and appearance of the organism. Darling believes that the natural mode of infection is probably by means of an intermediary host, probably some suctorial insect, either directly or by means of an alternating host, such as a wild rat or other susceptible animal.

Rheumatism. The contributions that have been made in the study of the bacteriology of rheumatism have been very numerous. They may be divided into several categories, and in the first series may be placed the observations in which no organisms could be found. These negative results may be explained either by the absence of organisms or by a faulty technique. In the second series are placed the observations in which various well-known bacteria, chiefly the pus-forming varieties, have been isolated from cases supposed to be rheumatism. The various bacteria include the streptococci and *Staphylococcus aureus* and *albus*. These cases may be explained by the fact that these organisms frequently complicate cases of rheumatism, or the joint affections caused by them may easily be mistaken for true articular rheumatism.

¹ Archives of Internal Medicine, August, 1909, p. 150.

In the third group is an organism which has been described by a number of different observers, a diplococcus described by Triboulet in 1897, and by Wassermann in 1899. This work has been confirmed by various observers, among whom may be mentioned Poynton and Paine, and this organism is very generally accepted as the cause of the disease.

One of the most recent contributions is that of G. Rosenthal, who reported at the Budapest Congress the result of his work on acute rheumatism.¹ In 1891 Achalme announced his discovery of an anaërobic bacillus which he had found in a case of acute rheumatism. In 1897 Thiroloix, by using special blood cultures, was able to grow this organism, and it has been a subject of considerable research by Thiroloix and G. Rosenthal. They are of the opinion that it is the specific cause of rheumatism, and have been able to reproduce analogous lesions in young pigs, calves, and monkeys. They have undertaken considerable experimental work to show that this organism has two varieties, one the *Bacillus perfringens*, which may be transformed by cultural methods into the second variety, or the bacillus of rheumatism (Achalme), which may be further transformed until it resembles an organism described by Thiercelin. They have immunized horses against this bacterium, which they claim has some action on the course of the disease, and they also believe that they have obtained some favorable results by using vaccines, especially between the attacks, in order to prevent their recurrence.

Before this work can be accepted as final it would have to be confirmed by other observers working along the same lines. The results of their work upon the serum does not strike one as being particularly satisfactory.

Rocky Mountain Spotted Fever. This interesting disease was known to the older physicians and residents in certain parts of Idaho and Montana, and probably has existed there for a very long while. It began to be well known some thirty or forty years ago, and was very carefully studied in 1908 by Maxey. Maxey's first communication, published in the *Medical Sentinel*, October, 1899, defined it as follows: "An acute endemic, non-contagious, but probably infectious febrile disease characterized clinically by a continuous, moderately high fever, severe arthritic and muscular pains, and profuse petechial or purpurial eruption in the skin, appearing first on the ankles, wrists, and forehead, but rapidly spreading to all parts of the body."

Other studies have been made by Wilson and Chowney, Anderson, King, and Stiles. The disease in Montana differs slightly from that found in Idaho, the patients in Montana usually dying before any gangrene occurs, though it may be found in the Idaho cases as a late

¹ Archives Générales de Médecine, August, 1909, p. 571.

symptom, involving the faucial pillars and soft palate and sometimes the scrotum. The pathological changes are those of an acute infection, consisting of an enlargement of the spleen and of the lymph nodes, a swelling and degeneration of the liver and kidneys. The disease may be mild or severe, and in western Montana the mortality ranges from 65 to 90 per cent., children being more liable to recover than adults.

The disease is transmitted to man by the bites of the spotted fever tick, of which there are two species, the one found in Montana, the *Dermacentor venustus*, and the other in Idaho, which has been given the name *Dermacentor modestus*.

The advent of the lumber industry and railroad construction has considerably increased the disease, as a greater number of people have entered that part of the country in which the infected ticks are found.

The ticks were first associated with the disease by Wilson and Chowney in 1902. They also described a protozoön to which they gave the name *piroplasma hominis*. Their studies were followed by those of the Public Health and Marine Hospital Service, by Anderson, Stiles, and King. Anderson agreed to the essential claim of Wilson and Chowney, while Stiles expressed his disbelief in the tick theory, and was also unable to find the piroplasma.

Ricketts¹ has given an account of his studies of the Rocky Mountain spotted fever. He found that a number of animals were susceptible to the disease. The rabbit, horse, and monkey (*Macacus rhesus*), and at least five species of small wild animals, have a greater or less degree of susceptibility. The guinea-pig is particularly susceptible, and they have been used for most of the experiments. Ricketts determined beyond doubt that the disease may be transmitted to a healthy animal from a diseased one, it only being necessary to permit a tick to feed on a diseased guinea-pig a sufficient length of time and then transfer it to a healthy animal as soon as it can be induced to bite. The disease is transmitted from infected ticks to about 50 per cent. of the young. These ticks are known to grow naturally on at least seventeen of the domestic and wild animals of the Rocky Mountains, and experimentally they feed readily upon guinea-pigs, rabbits, and monkeys. They are slow feeders, and require from fifteen to twenty minutes to take hold, and from several hours to several days to become entirely satisfied.

McCalla and Brereton have succeeded in transmitting the disease from man to man by placing the ticks taken from a patient on a healthy individual. The disease is one of the spring months, probably depending upon two facts in relation to the development and habits of the ticks. The cycle of development is annual, and, secondly, only adult ticks are found as parasites of man, and the adult ticks are to be found,

¹ Medical Record, November 20, 1909, p. 844.

as a rule, only in spring. It is very probable that the disease is kept up by the infection of susceptible small wild animals, and although the disease is of short duration in these, it is quite possible that they serve as a source of infection to other ticks during the period of the disease.

Ricketts was unable to find either the piroplasma or spirilla. He did find, however, that a small diplococcus-like body could be demonstrated in the blood of the infected animals and in man. They appear as very minute granules which might easily escape attention. It has been impossible to cultivate this organism by any of the ordinary methods, but it has been found present in very large numbers in virulent eggs of the tick. A specific agglutination reaction can be obtained from these organisms as they exist in the eggs. A serum from normal guinea-pigs produces a very slight agglutination in proportions of 1 to 1 up to 1 to 20, while in infected guinea-pigs the blood will produce striking agglutination with dilutions up to 1 to 320.

Sarcosporidiosis in Man. Darling¹ has reported an interesting case of infection with the sarcosporidia. This is the third case that has been reported in medical literature of infection of man with this parasite.

Sporozoa were first discovered in the striated muscle by Miescher in 1843, who described them in domestic mice. Since that time they have been observed in a great many animals, both domestic and wild. The parasites are found either in the muscle fibers or in the connective-tissue spaces about the muscle. They consist of oval, cylindrical, or fusiform parasites, and vary in size from an organism that can only be made out with a microscope to one that is visible by the naked eye. They increase by division of the nucleus.

It is remarkable that the parasite is not found more often in man. It is found in 95 per cent. of sheep and 98.5 per cent. of pigs, and Theobald Smith has suggested that sarcosporidia may be present in man in many cases where it is not suspected, as the muscles are rarely subjected to any special study at autopsy.

Darling's case occurred in a negro who had passed through an attack of typhoid fever in which there was associated as a complication necrosis and myositis of some of the striated muscles. Darling is inclined to believe that the necrosis and myositis was due to the typhoid bacillus. Sarcosporidia infections probably take place through the gastro-intestinal tract, and appear to give rise to little or no discomfort. There is no eosinophilia as in trichinosis.

Scarlet Fever. ETIOLOGY. As the cause of scarlet fever has not been solved by direct bacteriological examination, Livierato² made a study of 18 cases of scarlet fever to see whether there were any

¹ Archives of Internal Medicine, April, 1909.

² Pathologia, December, 1908.

specific antistances in the blood serum of scarlet fever patients. He experimented with the *Streptococcus pyogenes*, *Staphylococcus aureus* and *albus*, diplococcus of Fränkel, typhoid bacillus, bacillus of influenza, and the *Bacillus coli*. Sterile, watery emulsions of the organisms were made from twenty-four hours' culture, and the alexin, the emulsion of culture, and the serum are placed in tubes. After three hours in a temperature of 37° C. the hemolytic mixture is added, and in from three to five hours the nature of the reaction is determined. In cases of the streptococci absolute inhibition of hemolysis occurs, while it proceeded normally with all the other organisms. Two types of streptococci were used, one from a mixed diphtheria infection and the other from a case of erysipelas.

THE TREATMENT OF SCARLET FEVER WITH SERUM. Moser's serum continues to have the most favorable reports. Egis and Lingorsy give a favorable report in their series of cases, claiming to have reduced their mortality from 47.4 per cent. to 16.1 per cent. The serum to be effective must be injected during the first three days, or the fourth at the very latest, the earlier the better. The fever was less and complications infrequent. Owing to the large amount of serum, complications due to it were frequent.

On the other hand, Moltschanoff did not get very satisfactory results. He did observe a fall of temperature and improvement in the general condition, but is not inclined to believe that the scarlatinal process is, on the whole, very much affected.

Charlton has made a serum very similar to that of Moser, that is, by using streptococci obtained from the cadaver of a scarlet fever patient and immunizing horses with these without first passing them through other animals. He claims to have obtained favorable results in cases which he has treated.

Palmirski and Zebrowski, believing that a streptococcus is the cause of scarlet fever, have made a serum with various strains of streptococci, and they claim by its use to have very materially lowered the mortality rate.

Young, using some of the ordinary antistreptococcus serums and Aronson's serum, obtained results which he reports as distinctly encouraging.

Pulawski, using a serum from Bujwid's laboratory in Cracow, claims to have reduced the mortality from 71 per cent. to 28 per cent.

While it seems extremely probable that a satisfactory serum for scarlet fever will be eventually found, that used at present does not seem to be of sufficient value to be recommended for routine practice.

VACCINATION IN SCARLET FEVER. This has apparently been tried only in Russia. Gabritchewsky, of Moscow, made a vaccine from the streptococci taken from fatal cases of scarlet fever, sterilizing the cultures by heat. This he used with a view to preventing the disease, and in

a certain number of cases the injections were followed by an eruption much resembling that seen in scarlet fever and sometimes by angina and vomiting. From this and other evidence he believes that the streptococcus is the cause of scarlet fever.

The same serum has been tried by Langowoy with practically the same results. As to whether the children treated have subsequently had scarlet fever has not been reported.

APPENDICITIS AND SCARLET FEVER. Kauffmann¹ believes that the appendix shows an almost constant lesion in scarlet fever, characterized by hyperemia and enlargement of the mesenteric lymph nodes. He regards the appendix as the abdominal tonsil, and does not think it strange that such changes should occur. He is inclined to attribute the vomiting and more or less abdominal pain and intestinal disturbance to these changes in the appendix. He claims to have found both the microscopic and macroscopic changes in the cases which he studied. He has also noted the existence of marked cases of appendicitis in the course of scarlet fever, and in these cases the prognosis is most grave.

Sleeping Sickness. **THE TRANSMISSION OF THE SLEEPING SICKNESS.** Two problems now claiming the attention of scientists investigating sleeping sickness are the method by which the tsetse flies transmit sleeping sickness and other trypanosomatic infections and whether the trypanosome undergoes development in the fly.

Among the most important contributions have been the experiments of Bruce² and Kleine.³

The original idea of the transmission of the infection was that the flies sucked up the infected blood and later, when feeding on a second animal, injected some of this and so transferred the disease. This conclusion seems to be confirmed by the fact that the flies apparently lose the power of transmission soon after feeding.

From the recent experiments, however, it would seem that the trypanosome undergoes evolution in the fly probably in somewhat the same manner as the malarial parasite does in the mosquito.

In the experiments with flies allowed to feed on infected monkeys and later on uninfected ones it was found that all the monkeys were infected, the last one twenty-two days after the flies had become infected. Taute was able to produce infection during the first three days after feeding, from the fourth to the tenth day the disease could not be transmitted, but from the eleventh to the forty-fourth day the flies again became infective.

Kleine's laboratory experiments seem to prove that the period of development in the fly is about twenty days, and, as has been pointed

¹ Annales de médecine et de Chirurgie infantile, 1909.

² Bulletin of the Sleeping Sickness Bureau, 1909, No. 7.

³ Weitere wissenschaftliche Beobachtungen über die Entwicklung von Trypanosomen in Glossinen, Deutsche med. Wochenschrift, May 27, 1909, pp. 924, 925.

out, in order to get perfectly trustworthy results flies must be used that are known to be free from infection, that is, flies that have been raised in the laboratory, and as they may harbor other varieties of trypanosomes the work should be carried out with pure cultures.

THE PREVENTION OF SLEEPING SICKNESS. Some rather interesting experiments in preventing sleeping sickness have been carried on under the direction of Sir Henry Hesketh Bell, Governor of the Uganda Protectorate. The mortality of this disease in the Protectorate has been as high as 20,000 a year. This fell in 1908 to less than 2000, and at present the deaths that have occurred are almost exclusively in the segregation camps. The method used was the depopulation of several hundred miles along the shore of Lake Victoria, the inhabitants of this region being moved farther inland. It is hoped that by continuing this method the sleeping sickness may be brought entirely under control. This is encouraging, as no really curative method against the disease has been discovered.

THE CEREBROSPINAL FLUID IN SLEEPING SICKNESS. Broden and Rodhain¹ have examined 145 cases. They discovered no changes in the early stages of the disease, but as soon as the symptoms were definitely established there was a marked lymphocytosis, and an increase in the amount of serum albumin and globulin. Trypanosomes were found only in the later stages of the disease and were not constant. These observers suggest that the treatment of the patient with atoxyl be continued until the cerebrospinal fluid is perfectly normal.

Smallpox. **THE BORDET-GENGOU REACTION.** Beintker,² using the serum of a rabbit injected with the extract of the spleen from a person dead from smallpox, has succeeded in getting positive reactions in the presence of vaccine lymph and also by mixing the extract of the spleen with the serum of a rabbit injected with vaccine lymph. The reaction was positive in three cases of smallpox in which the vaccine lymph was used as antigen.

Tuberculosis. It is almost impossible to give in a few pages anything like an adequate review of the contributions made on the subject of tuberculosis. During the year the *Transactions of the International Congress* have appeared, and they form quite a complete résumé of our knowledge on the subject of tuberculosis. Some of the more important articles have been reprinted elsewhere and are noted below.

One of the most important problems is the question of the transmission of tuberculosis from cattle to man, particularly by means of milk, and another problem of equal importance is the question of diagnosis by means of tuberculin. The third question, which is still in a very unsettled state, is the value of proper methods of using tuber-

¹ Le Névraxe, January, 1909.

² Centralblatt f. Bacteriologie, December 17, 1908.

culin in the treatment of tuberculosis. Tuberculin, while it is of value in certain selected cases, should probably only be used at present by those thoroughly conversant with all the phases of tuberculous infection, as the amount to be administered and the time and the cases which it may benefit can only be chosen by one who has had considerable experience, and even then there is a pretty large margin for error.

DISSEMINATED MILIARY TUBERCULOSIS OF THE SKIN. There is an eruption on the skin in cases of miliary tuberculosis of infants and young children which, while it has been noted by many observers, has never had the prominence given to it which it would seem to merit, as it is of great value in making the diagnosis. It is also of prognostic value, as almost every case in which it occurs proves fatal. The eruption is caused by a deposit of tubercle bacilli in the skin, and the bacilli may be demonstrated in preparations from the papules.

Tileston¹ has recently made a study of this eruption in a number of cases, and he was able to demonstrate the tubercle bacilli in 71 per cent. The eruption consists of scattered discrete papules about the size of a pinhead, and on these are tiny vesicles with cloudy contents or minute pustules. The vesicle soon ruptures and dries and leaves behind a slight crust. At this stage the eruption is most characteristic. It is about the size of a rose spot as seen in typhoid fever, is of a dull red color, and is slightly elevated. On removing the crust a small sharply defined hollow may be noted. If the child lives long enough healing takes place and a small white scar is left surrounded by a small area of brownish pigmentation. The eruption comes out in crops, and each spot probably lasts for from one to three weeks. It is usually located on the parts covered by the napkins, the buttocks, genitalia, and adjacent portions of the thighs. They may also be seen on the abdomen, front of the chest, thighs, and legs. The appearance of the rash is quite characteristic, and is easily recognized when once seen.

TUBERCULOSIS OF THE PARATHYROID GLAND AND ITS RELATION TO THE OCCURRENCE OF TETANY IN TUBERCULOUS MENINGITIS. Winternitz² has reported a study of two cases of tetany occurring late in the course of tuberculous meningitis. Carnot and Delion, several years ago, had a case of tetany occurring in general tuberculosis where meningitis was excluded at autopsy, and they found one of the parathyroid glands diseased, and ascribed the tetany to that lesion. More recently four other cases have been reported, and in all of these only one parathyroid was affected. All had general tuberculosis, but there were no symptoms of tetany in any of them.

Winternitz concludes that tetany may occur in advanced tuberculosis and may be associated with tuberculosis of the parathyroid, but that

¹ Archives of Internal Medicine, July, 1909, p. 21.

² Bulletin of the Johns Hopkins Hospital, September, 1909, p. 269.

the lesions in these glands in the cases so far reported are not extensive enough to account for the symptoms. In this connection he has called attention to the fact that in advanced tuberculosis there is disturbance of calcium metabolism in the body, as has been pointed out by Glaube and Senator and others, the change being an excessive excretion of calcium. It is possible that this may bring about a hyperacidity of the nerve cells, and that the presence of even a slight lesion in the parathyroid glands is sufficient to cause tetany. When tetany occurs as a complication of tuberculosis the calcium salts should be administered.

A NEW CLINICAL SIGN IN THE EARLY DIAGNOSIS OF TUBERCULOSIS. M. Poenaro-Caplesco¹ has called attention to a new sign which he calls the *upper eyelid sign*, or the *orbital palpebral sign*, which consists of a swelling of the upper eyelid. Sometimes this is so marked as to lead to the suspicion of nephritis, but in the cases which he studied the kidneys were apparently perfectly normal. There were 61 patients in which the sign was present and who did not show any apparent tuberculosis. In some of the patients in whom the swelling was most marked there were also signs of Basedow's disease and slight tachycardia and hypertrophy of the thyroid, so that the observer questioned if this symptom was not in some way the result of the toxins of tuberculosis on the thyroid gland or on the sympathetic and pneumogastric nerves. Of course, this sign is not one which one would expect to be of any very practical value, and yet it would be most interesting to have reports on a large number of cases, as anything in the hands or face indicative of disease is of especial value, particularly to those who have to make routine examinations more or less hurriedly.

TUBERCULIN REACTION IN THE DIAGNOSIS OF TUBERCULOSIS. There has been so much written and said about tuberculin reactions, and there has been so much contradictory evidence, that one welcomes an article like that of Hamman and Wolman.² These observers have made a careful study of a very large and miscellaneous material, and the results of their observations are very important.

It might not be out of place to speak of the methods used. Von Pirquet's cutaneous reaction was made by placing a drop of pure tuberculin on the skin and through it making a few very superficial incisions with the point of a scalpel. Controls were formerly used by Hamman and Wolman, but they so uniformly obtained negative results from them that they were subsequently abandoned.

In order to make the test less delicate dilutions were resorted to, and on the cleaned outer surface of the arm there were placed in a row a drop of 1 per cent. solution, a drop of 5 per cent. solution, and a drop of 20 per cent. solution of old tuberculin. With a sterilized scalpel

¹ Bull. de la Soc. des sciences méd. de Bucarest, June, 1908.

² The Cutaneous and Conjunctival Tuberculin Tests in the Diagnosis of Pulmonary Tuberculosis, Archives of Internal Medicine, May, 1909.

two small parallel incisions were made in the skin, first through the 1 per cent., then through the 5 per cent., and then through the 20 per cent. solution. The incisions should be as superficial as possible, but occasionally bleeding occurs. The tuberculin is allowed to remain two or three minutes after the incision is made, then is covered with a piece of gauze held in place by strips of adhesive plaster. This method is essentially the same as that employed by von Pirquet, except that the latter uses a spatula-shaped instrument which is rotated three or four times through the drop of tuberculin, causing a pit-like abrasion of the skin. Von Pirquet's instrument causes a good deal of pain in children, and it is harder to distinguish the reactions on account of the inflammatory areola which surrounds it. The reactions with it are milder and less definite.

The active reaction, or the specific normal reaction of the tuberculin begins from four to six hours after the inoculation, and attains its maximum in from twenty to twenty-four hours. This persists through the second day, and shows a decrease on the third or, at the latest, on the fourth day.

Wolff-Eisner also speaks of a premature reaction which begins in about six hours and disappears rapidly, and also a late persisting reaction beginning like the others, but reaching its maximum slowly at the end of the second day or longer and persisting usually for about a week. The premature reaction is supposed to occur in patients with manifest tuberculosis who are not doing well, and the late reaction in patients with an inactive tuberculous lesion.

The conjunctival reaction, usually called Calmette's reaction, but which was announced by Wolff-Eisner in the discussion of von Pirquet's paper, has been modified by different observers, most of the Germans using 5 per cent. or other dilutions of old tuberculin, while Calmette precipitates old tuberculin with alcohol, and, after washing the sediment, redissolves it in salt solution in from 0.05 to 2 per cent. strengths. This latter method gives a purified tuberculin, approximately ten times stronger than the old tuberculin. The strength of the tuberculin used is a matter of importance in comparing results of various observers.

Hamman and Wolman use the following method: The eyes are first inspected to see that the conjunctivæ are healthy and alike in appearance, and then one drop of a 1 per cent. solution of old tuberculin is dropped into the left conjunctival sac. The sac is then manipulated so that the fluid is equally distributed. The following morning, that is, after twenty or twenty-four hours, if the left eye shows no reaction, a drop of a 5 per cent. solution is instilled into the right conjunctival sac. At the end of another day the eyes are again inspected, and in some instances a third instillation of a drop of a 1 per cent. solution was made in the left eye. If there was no discernible difference in the two conjunctivæ, the reaction was regarded as negative. If the con-

junctiva of the eye which received the injection was a little redder than the other eye, but the difference not marked enough to permit the reaction to be called definitely positive, it was called slight or doubtful, while positive reactions were marked by a definite palpebral redness, sometimes with secretions and sometimes palpebral and bulbar redness, with subjective symptoms and well-marked secretion. In making the examination the lower lids should be well pulled down and the patients directed to move the eyes in different directions.

In adults the cutaneous tuberculin test is of value in diagnosis only when it is negative and the frequency of its occurrence runs roughly parallel with that of a subcutaneous test. The conjunctival test is of value principally on the positive side, and definite reaction indicates the presence of an active tuberculous lesion.

Hamman and Wolman think that the most satisfactory results are obtained by using the two tests simultaneously. If both are negative, it means that there is an absence of an active tuberculous focus. If both are positive it means that there is somewhere an active lesion. If the conjunctival is negative and the cutaneous is positive, the information is of no particular value. They do not believe that the conjunctival and cutaneous reactions have any prognostic value, and this is of interest, as some observers, particularly Wolff-Eisner, claim that the blood to react to the test represents a high degree of resistance to tuberculous infection, that is, getting a good reaction means that the individual has a good resistance, and that an inability to react indicates a want of such resistance, and, of course, an individual with a good resisting power would stand a much better chance of recovery than one without it.

The same conjunctiva should never receive the second instillation, as the reaction so obtained is of no value in diagnosis and the procedure is not without danger. It is also believed that, with the proper precautions, the conjunctival test may be used without danger of permanent injury to the eye.

I cannot recommend the conjunctival test, as in the present state of our knowledge its indiscriminate use by untrained observers has been followed by disastrous results, and these will probably continue to occur. It is exceedingly difficult to get all clinicians to use tuberculin in a rational and careful manner.

The unfavorable results are seen especially in the tuberculous, but even severe inflammations may occasionally result, and these may come on after the tenth day, particularly in the non-tuberculous. The cornea remains sensitive for many months and the second instillation of tuberculin may set up a very violent reaction.

The cutaneous reaction is of much greater value in infants than in older people, and its value decreases in direct proportion to the age of the child. In very young infants only a very small number of those

non-tuberculous show the reaction, while between five and eight years of age, according to von Pirquet, 36 per cent. of the children clinically not tuberculous give the reaction. In adults the cutaneous reaction has all the disadvantages of the subcutaneous method, and the number of reactions in healthy individuals is just as high and it does not give any information as to the seat and extent of the lesion, as do the focal reactions which so often follow the subcutaneous test.

Moro, in 1908, described his test, which consists of rubbing into a small area of skin an ointment composed of six parts of old tuberculin and five parts of lanolin. The spot treated is covered with gauze, and in from twelve to twenty-four hours a positive reaction should appear and consists of a general redness and the appearance of a number of small papules.

Hamman and Wolman have been unable to confirm in any way the claims made by Detre for his differential cutaneous reaction. This reaction consists in doing simultaneously the von Pirquet test with human old tuberculin and of human and bovine bouillon filtrates. The resulting reactions are measured in millimeters, and Detre believes that he is able to say whether the infection is of the human or bovine type.

TUBERCLE BACILLI IN THE SALIVA. Dunkley,¹ believing that the danger of the sputum as a carrier of tubercle bacilli is greater than is ordinarily supposed, made a study of the saliva in 50 cases of pulmonary tuberculosis, only including cases in which the tubercle bacilli had been demonstrated in the sputum. He found that in the saliva taken from the anterior part of the patient's tongue the tubercle bacilli could be demonstrated in 29 cases. Not very much imagination is needed to see how tuberculosis can be transmitted from one person to another by means of the saliva, and there are a number of instances on record in which the skin tuberculosis has resulted from the accidental inoculation of saliva.²

INVESTIGATION OF THE BLOOD FOR TUBERCLE BACILLI. Walter Brem, Chief of the Medical Clinic of Colon Hospital, has reported his investigations on this subject,³ and has concluded that there is no positive proof of the frequent presence of tubercle bacilli in the circulating blood. He has determined that one source of error in observations was the contamination of distilled water with acid-fast organisms, and that in examining blood, urine, stools, sputum, and exudates for tubercle bacilli the greatest care should be used to exclude contamination of water and all solutions used with the members of the acid-resisting group of bacilli whether alive or dead.

This article is of particular interest to laboratory workers.

¹ *Lancet*, April 17, 1909, p. 1096.

² See below, "The Sources of Tubercle Bacilli Producing Human Tuberculosis."

³ *Journal of the American Medical Association*, September 18, 1909, p. 909.

THE HEART IN PULMONARY TUBERCULOSIS. Lawrason Brown¹ has contributed an interesting review on the cardiac complications occurring in pulmonary tuberculosis, and considers, first, cardiac disease developing during pulmonary tuberculosis. Non-tuberculous myocarditis and changes in the myocardium are rather frequent at autopsy, but difficult to make out clinically. They usually escape detection unless the pericardium is affected. It may be regarded as probably present when cyanosis, edema, dyspnea, and frequent, irregular small pulse occur.

Tuberculosis of the myocardium is very rare, about one case being found in 1000 autopsies. It has little clinical significance, as it is practically never recognized during life. Pericarditis occurs in about 6 per cent. of the cases, and probably only about half of these are recognized during life, as the symptoms are usually obscure. It is rather more frequent in childhood than in later life. Endocarditis is found more often clinically than at autopsy, and is found in about 1 per cent. of the cases. It most often occurs as a late complication, and attracts but little attention. Tuberculous endocarditis is very rare, and it has little or no clinical significance. The toxin of the tubercle bacillus is believed by some to be capable of producing a sclerotic valvular endocarditis which most frequently affects the mitral valve, producing a stenosis.

As to the question of pulmonary tuberculosis developing during cardiac disease, Brown points out that, roughly speaking, the greatest age incidence in pulmonary tuberculosis is between the twentieth and fortieth years, while in heart disease the most frequent period is either earlier or later. There are very marked differences in the statistics, but the association of heart lesion and pulmonary tuberculosis is probably more frequent than was formerly taught.

Mitral insufficiency is the most frequent lesion found, and lesions of the aortic and pulmonary valves are quite rare. Brown makes the following summary of the association of heart disease and pulmonary tuberculosis:

Pulmonary stenosis is always a primary disease and mitral insufficiency and aortic insufficiency are usually primary. The most frequent cardiac lesion secondary to cardiac tuberculosis in patients up and about is mitral stenosis. Pulmonary tuberculosis occurs more frequently in patients with pulmonary stenosis than in any other form of cardiac disease. Mitral insufficiency is associated with pulmonary tuberculosis more often than any other form of valvular disease, but aortic insufficiency is not very much less frequent. Aortic stenosis is very rarely associated with pulmonary tuberculosis, and pulmonary stenosis is infrequent. The treatment of valvular disease of the heart

¹ American Journal of the Medical Sciences, February, 1909, p. 186.

occurring under such circumstances does not differ from the ordinary methods in uncomplicated heart disease.

Pottenger¹ has made a careful study of the heart in cases of tuberculosis, and has found that there was relatively low blood pressure, especially in the advanced cases, brought about by the effect of the toxins on the vasodilators, weakness of the heart, and general wasting. The factors which tend to maintain the pressure are hypertrophy of the heart muscle and thickening of the systemic arteries, and this latter doubtless occurs as a result of the action of the toxins on the vessel wall, and is found especially in patients who have had tuberculosis for some time. Pottenger, like Brown and other observers, believes myocarditis to be very common in advanced tuberculosis, but one which is difficult to make out clinically. One must take into consideration in making such a diagnosis not only the signs on the part of the heart itself, but also the clinical symptoms and condition of the patient. Where recognized, it seems to yield to appropriate treatment. The diagnosis of heart lesions in advanced tuberculosis is always difficult on account of the changes in the surrounding organs and the presence of infiltrations, cavities, emphysema, and contractions. It must be remembered, in estimating the size of the heart, that as the heart pushes to the left it also pushes backward, and that the lateral diameter taken on the level with the fourth interspace does not give a correct size of the heart.

TRANSMISSION OF BOVINE TUBERCULOSIS TO MAN. This subject has been discussed so much and by so many observers one almost hesitates to say anything more about it. It is a matter of such importance, however, that one cannot pass over the subject without noting the article by Shaw,² which gives a statement of the opinions of various authorities and an interesting discussion of the subject.

The question cannot be regarded as definitely settled, but it may safely be stated that there exist two types of tubercle bacilli, one human and the other bovine. These can be told by cultural methods which can be carried out in any well-equipped laboratory, and apparently the bovine bacilli retain their characteristics even though transplanted into man and remaining there for years. It is also safe to assert that almost all of the cases of human tuberculosis are infected directly from other human cases, and that the means taken to reduce the mortality from this disease should undoubtedly be directed mainly toward reducing such infection.

Such observers as Park place the number of infections from the bovine type at about 1.5 per cent. of all the fatal cases, this calculation being made for New York City, and would represent about 200 deaths a year

¹ Archives of Internal Medicine, October, 1909, p. 306.

² Journal of the American Medical Association, November 27, 1909.

from this source, a comparatively small proportion of the total number of deaths from tuberculosis.

The only way to determine the exact truth about the matter is continued systematic study of the subject, not only in one spot but throughout the entire world. There has been so much popular talk about the transmission of tuberculosis from cattle that there is danger of diverting the attention due to human tuberculosis, fresh air, and sanitation to the milk supply; and while every one recognizes that the milk supply in America is very much in need of betterment, it is hardly proper that this should be directed mainly from the standpoint of tuberculosis. There are plenty of other good and sufficient reasons why the general milk supply should be improved, and not only tuberculosis but the danger of transmitting other diseases eliminated as far as possible.

Most of the cases of bovine tuberculosis occur in children, infection being through the intestine and the tuberculosis usually starting as a glandular type. Holt states: "Infection through the intestinal canal by means of tuberculous milk I believe to be a very infrequent means of acquiring tuberculosis in infancy."

It is interesting to note in this connection the statements made by Koch at the British Congress on Tuberculosis in 1901, and which aroused such great interest in the subject. His statements in substance were as follows: (1) The tubercle bacilli of bovine tuberculosis are different from those of human tuberculosis; (2) human beings may be infected by bovine tubercle bacilli, but serious diseases from this cause occur very rarely; (3) preventive measures against tuberculosis should therefore be directed primarily against human tubercle bacilli.

At Washington, last year, Koch called attention to the fact that of all the human beings who succumbed to tuberculosis, eleven-twelfths died of consumption of the pulmonary form, and only one-twelfth of the other forms of the disease. One would have expected that those who are interested in establishing the relations between human and bovine tuberculosis would search for the bacilli of the bovine type preferably in the cases of pulmonary tuberculosis. Koch stated that up to date (1908) in no case of tuberculosis of the lung has the tubercle bacillus of the bovine type been definitely demonstrated.

MEAT AS A SOURCE OF INFECTION IN TUBERCULOSIS. Littlejohn¹ reviews our knowledge of this subject and the work of the Royal Commission, and concludes that, while man can contract tuberculosis from the meat of cattle, after considering the difficulty experienced in transmitting human tuberculosis to cattle, we may, perhaps, assume that transmission of bovine tuberculosis to man is also difficult to effect. He also concludes that the infection of man with tuberculosis is not commonly caused by ingesting meat, and that the ordinary processes

¹ Practitioner, June, 1909, p. 843.

of cooking, in the majority of cases, are sufficient to render the contaminated meat non-infective; and that the flesh of tuberculous animals even in generalized tuberculosis is rarely infective except as a result of postmortem contamination. According to the reports of the Royal Commission, during the period in which the consumption of meat in man is increased in quantity, human tuberculosis has declined.

THE SOURCES OF TUBERCLE BACILLI PRODUCING HUMAN TUBERCULOSIS. Park¹ has given an interesting résumé of the sources of virulent tubercle bacilli. The number of living bacilli in the sputum is, of course, very great, and most of these are virulent. Park was able to produce tuberculosis in guinea-pigs by very minute injections of mixed sputum from tuberculous patients. Fifteen adult males, who were in good physical condition, but with fairly advanced pulmonary tuberculosis, were examined with reference to the number of bacilli in the mouth mucus between the periods of expectoration. They were found present, on an average, in one-third of the cases in every tenth oil-immersion field, and in one they were even more abundant. In four others, characteristic bacilli were found in less than two minutes, and in the remaining five they were missed in a similar length. The longer the period after expectoration the less, as a rule, were the number of bacilli. As some of the expectorated sputum always remains on the lips, the mouth is wiped off with the handkerchief and the hands are usually contaminated, so that living bacilli may easily be found on the clothing and various articles frequently handled by the patient. Fine droplets of mucus expectorated in violent coughing and sneezing may infect the air in the immediate neighborhood of the patient, but there are apparently few or no bacilli cast off in ordinary talking. The bacilli expectorated upon the floor or sidewalks may be gathered up by young children crawling about, or by flies and insects. The number of cases that are infected from rooms that have been occupied by tuberculous patients is comparatively small. In the report from the Phipps Institute Flick found only 4.8 per cent., and in most cases where infection is supposed to be due to this source it is liable to be doubtful. Disinfection of the premises after cases of pulmonary tuberculosis should be insisted upon, however, as even a small percentage represents an enormous number of actual infections.

A very large number of cases of infection occur from individuals who do not know that they have tuberculosis. Such people are usually among the lower classes who are exceedingly careless in regard to all sanitary precautions.

CONGENITAL TUBERCULOSIS. Rietschel² reports a case of congenital transmission of tuberculosis, and from a study of the literature con-

¹ Proceedings of the Sixth International Congress on Tuberculosis.

² Jahrbuch f. Kinderheilkunde, July 3, 1909, p. 62.

cludes that congenital tuberculosis can occur in a child when there is placental tuberculosis, the infection taking place either during the fetal period or during the birth. The last method of infection is more frequent than has been previously believed, and when it occurs the child always dies within the first six months of its life and usually within a few months. Sitzenfrey has reported one case which lasted half a year. It is not necessary where there is placental tuberculosis for the child to become infected. It is also true that infection during the first few days or weeks after the birth of the child is exceedingly severe, and the child usually dies after a short period. Rietschel is not of the opinion that there is any latent stage for the tubercle bacillus in young infants, and could find no evidence to support the theory of von Behring and Baumgarten in reference to the latency of the tubercle bacillus in young babies.

THE VIABILITY OF THE TUBERCLE BACILLUS. Rosenau¹ has published a short but valuable contribution on the subject of the viability of the tubercle bacillus, and also gives the bibliography of the subject. One of the most interesting contributions on this subject was the prize essay of Ransome which was published some years ago, and which details the interesting experiments which Ransome made, part of them in collaboration with Delepine.

Rosenau and others believe that the only criterion of the death of the tubercle bacillus depends upon animal experimentation, but even this may be uncertain, as the virulence of the bacillus fades before it dies. The much-vexed question as to whether there are spores or not may be dismissed so far as its viability is concerned, and it is doubtful whether the waxy substance protects the bacillus against external harmful influences to any unusual extent. Curiously enough, the thermal death point is much lower than was once considered possible, an exposure to 60° C. for twenty minutes being all that was necessary to kill the organism. Some of the earlier reports on this subject have been made by experimenters who failed to recognize lesions produced by dead tubercle bacilli, and it is to be recommended that where the lesions in the test animal are doubtful inoculation into secondary animals should be made to determine whether one is dealing with living or dead organisms.

There is another very curious fact, that the tubercle bacillus, while it does not live very long on artificial culture media, has a very long life even under unfavorable conditions, and practically all observers are agreed that they may remain alive and virulent in dry sputum for several months.

The action of direct sunlight is well known ever since Koch found it would kill the tubercle bacilli within a few minutes to several hours,

¹ Bulletin 57, Hygienic Laboratory, Public Health and Marine Hospital Service.

depending upon the brightness of the sun, the time of the year, and other conditions. This is one of the greatest arguments for well-lighted, sunny rooms in the stamping out of the disease. In water the tubercle bacilli may live and remain virulent for several months.

TENT SHELTERS IN TUBERCULOSIS. While the use of tents and shacks has been of the greatest possible service in the treatment of tuberculosis, there is one point of great importance to which Woodruff¹ has called attention, and that is, their indiscriminate use during the summer weather. Woodruff found, at the Jamestown Exposition camp, that every fever exposed in tents had an abnormally high temperature, and that when the cases were transferred to the comfortable quarters at Fortress Monroe the temperature would fall from 2° to 4°. This corresponds with the observations of White, of Colorado Springs, who found that in an individual suffering with tuberculosis, when exposed to the sun the temperature increased. The same thing may be said of typhoid fever and other fevers.

Where tents and shacks are used in summer they should be properly shaded, and where the temperature in the tent is very high an effort should be made to remove the patient to a cooler place during the heat of the day. If the tents are of a proper color which would keep off the glare, they will be found much more comfortable and efficacious than the ordinary uncolored canvas.

MARMOREK'S ANTITUBERCULOSIS SERUM. There have been a number of reports upon the use of Marmorek's antituberculosis serum, among which may be mentioned those of Preleitner,² Szurek,³ and Wein.⁴

Preleitner gives a brief résumé of the previous work that has been done with this serum. This serum is interesting because it has been suggested that it would favorably influence surgical cases of tuberculosis, and also from the fact that one method of administering it is by rectal injection. Szurek has stated that the serum may be used without danger; it does no harm, and even over long periods of time the injections are well borne.

Marmorek, from his experiences with Koch's tuberculin, arrived at the opinion that this was not the true poison of the tubercle bacillus and not the chief cause of the manifestations of tuberculosis. He thought that the tuberculin was only a stimulant which excited the tubercle bacillus to secrete this other unknown toxin. There is no reaction in healthy individuals, because no bacilli are present. In mild and moderate cases of tuberculosis there is a reaction, while it is wanting in the advanced cases, because when very large numbers of bacilli are present there is so much poison produced that the amount added by

¹ American Medicine, August, 1909, p. 399.

² Wiener medicinische Wochenschrift, February 20, 1909, p. 419.

³ Ibid., August 14, 1909, p. 1895.

⁴ Ibid., March 13, 1909, p. 575.

the reaction caused by the injection of tuberculin is comparatively small in comparison with that already present.

This serum is made by injecting peptonized bouillon into the abdominal cavity of guinea-pigs and after forty-eight hours using the fluid, which is very rich in leukocytes. With this he repeatedly injects a calf and then uses the serum, so-called leukotoxic serum, mixed with glycerin and bouillon, as a culture media for the tubercle bacillus. In the filtrate from these cultures he has been able to demonstrate the tuberculosis toxin, and with this he has immunized horses, from which he secures his antitoxin. More recently he has added the streptococci from the sputum of tuberculous patients, and so obtained a double serum, which he believes to be of special value in advanced febrile cases of tuberculosis of the lungs. This serum is used in subcutaneous injections from 1 to 3 c.m., or it may be administered by rectal injection.

There have been some favorable reports on the use of this serum, among which may be mentioned those of Leiwin, Kohler and Jacobson, Hoffa, Steinberg, and Ullmann. There have also been perhaps a greater number of unfavorable reports, among which may be mentioned Stadelmann, Benfey, Krokiewicz, Engländer, Mann, Hijmans, and Polak-Daniels. To this list may be added Preleitner, whose results might be regarded as negative.

Wein is of the opinion that Marmorek's serum is a distinct advance, and that we can look for further results in the future, while Szurek, as a result of his experiences with the serum, does not regard it as of any particular value, as its antitoxic power is too small, but thinks that its chief value has been that it is, in a certain measure, an evidence that there will be found some specific way to produce a passive immunity.

Typhoid Fever. **TYPHOID BACILLI CARRIERS.** The subject of the recent contributions on typhoid fever will not be complete without reference to the possibility of the transmission of the disease through typhoid bacilli carriers.

This subject became of especial interest to Americans through the now rather celebrated case of "Typhoid Mary," a cook who, during the last eight years, had been employed in eight different families, and in seven of these typhoid fever had broken out within a few weeks or months after her arrival. In all she is known to have infected twenty-eight persons, two of whom died. This patient was studied by Dr. W. H. Park.¹

It is interesting to note that Justice Erlanger, of the Supreme Court, has denied the application of this patient for liberation from the isolation hospital on North Brother Island. This is an important step in the prevention of the spread of typhoid, as in New York, at least, a chronic typhoid carrier may be legally isolated until cured.

¹ Journal of the American Medical Association, September 19, 1908, p. 981.

Typhoid carriers have been reported upon by numerous observers. In 1902 von Drigalski and Conradi reported upon finding typhoid bacilli in the stools of four persons who never had had typhoid fever, but who had been in contact with cases. Kayser, Lentz, and others have found that persons having had typhoid fever in some instances after convalescence continue to discharge large numbers of bacilli which are capable of transmitting the disease.

Park has concluded that about 2 per cent. of the persons who have had typhoid fever are typhoid bacilli carriers, and in a few of these the bacilli pass out in the urine, but in most cases with the feces. He also concludes that perhaps one in every 500 adults who have never knowingly had typhoid fever are typhoid bacilli carriers. This introduces into the causation of the disease a hitherto little studied factor, and one with which it is most difficult to cope. Attempts at rendering the feces sterile by the use of hexamethylenamin (urotropin) and other drugs have not up to this time been satisfactory.

The Treatment of Typhoid Carriers by Vaccines. Irwin and Houston¹ treated a case of persistent *typhoid bacilluria* by means of a vaccine prepared from typhoid bacilli, with very good results. While it would seem that a simpler method of dealing with such cases would be an internal administration of hexamethylenamin, the method might be tried to advantage in cases in which the typhoid bacillus persists in the feces, and it would be extremely interesting to know the results, as in such cases all other forms of treatment tried so far have been unavailing.

TYPHOID BACILLURIA. Connell² has made an exhaustive study of the subject of the typhoid bacillus in the urine. He finds that they are present in at least 24 per cent. of all cases, and that they are usually found in enormous numbers appearing about the time the temperature falls to normal. They continue to vary in intensity, persisting usually for several weeks, and finally disappear spontaneously. This bacilluria he thinks arises from infection of the bladder urine from the blood, probably by way of the kidney. The typhoid bacilli grow most rapidly in urine of low acidity, and as the urine at the height of the fever is usually highly acid, it is a poor medium for their growth, while in the declining stage the low acidity permits rapid multiplication of the bacilli. In some instances atony of the bladder and overdistention may be factors in infection of the bladder. These things are more liable to occur in the severe cases than in the mild ones, and there is no relation whatever between the character of the eruption and the bacilluria. Albuminuria is not essential to the growth, but when albumin is present it makes a better culture medium, and it is also

¹ Lancet, January 30, 1909, p. 311.

² American Journal of the Medical Sciences, May, 1909, p. 637.

probable that when present the kidney will be more liable to allow the passage of bacteria from the blood.

As a rule, there are no subjective symptoms. The urine may be slightly turbid and may show a small amount of pus, but the diagnosis must rest upon finding the bacteria in cultures from the catheterized or cleanly passed urine. Complications, as a rule, are rare, and while acute typhoid cystitis may occur, inflammation of the bladder is usually due to some other organism. Patients having typhoid bacilluria are a menace to the public health, as they are a means of spreading the disease. To obviate this, hexamethylenamin may be administered and Shattuck advises 10 grains three times a day, twice a week, during and after typhoid fever. Larger amounts are often advised, especially during the last week of the disease and the first two weeks of normal temperature. The drug should not be continued too long, nor should it be given in too large doses, as it may produce tenesmus, hematuria, and it is said even hemorrhagic nephritis. Under its use bacteria disappear from the urine in a few days.

TYPHOID AS A CONTACT DISEASE. In a study on the origin and prevalence of typhoid fever in the District of Columbia,¹ by Rosenau, Lumsden and Kastle, attention is called to the fact that typhoid should be regarded as a disease that can be transmitted from contact as well as by infected milk and water. This is not a new idea, but one which has not been sufficiently urged in considering the question of prophylaxis.

In almost all instances where two or more cases occurred in the same house, they were in families where no servants were employed and the care of the patient fell upon some member or members of the household. In quite a number of cases investigated the patient lived in a building in which there were grocery stores, and in one instance in a bakery, and in one instance in a saloon. These patients were nursed, for the most part, by a member of the family or other person who attended also to the business. It is quite easy to see how in this manner disease could be transmitted to a large number of individuals.

The frequency with which the disease occurs in nurses and others handling typhoid should lead every physician to instruct persons having anything to do with typhoid to be exceedingly careful. It would seem a proper precaution to quarantine typhoid much in the same way that diphtheria and scarlet fever are quarantined, and to have inspectors to see that the discharges from the patient are properly disinfected and that the other things which come in contact with the patient are properly disposed of. Among the poorer classes of people attempts should be made to remove the cases to hospitals as far as possible.

THE SURVIVAL OF THE BACILLUS TYPHOSUS IN MILK WHEN USED IN ORDINARY BREAKFAST TABLE COFFEE AND TEA. Hill² has made

¹ Bulletin No. 52, Public Health and Marine Hospital Service, 1909.

² American Journal of Public Hygiene, February, 1909.

experiments which show that the typhoid bacilli in milk, when mixed with hot tea or coffee, can be recovered from it twenty-four hours later except when the temperature of the mixture was above 68° C. As very few people can take coffee at above 50° C., the milk used in tea and coffee must be considered a possible means of transmission of the disease.

PERFORATION OF THE INTESTINE. Patterson¹ has reviewed the literature of this subject, including the reports of 369 cases, being a résumé of the literature since the paper of Harte and Ashhurst which, was published in the *Annals of Surgery*, January, 1904. This latter paper records 362 cases, with 268 deaths and an operative mortality of 74.05 per cent.

Patterson's statistics include 21,215 cases of typhoid fever, in which perforation occurred in 671, or 3.16 per cent.; of this number, 242 died, giving a mortality of 1.14 per cent. Perforation occurred with the greatest frequency in males, 281 cases being men, 58 women, and in 30 cases the sex was not stated. Most of the cases occurred under thirty. The frequency of its occurrence at this age and the large number of males are merely owing to the greater incidence of the disease in the male sex at this age period.

The prevailing view that perforation is rare in children is not borne out, as Elsberg has shown. He collected 25 cases, and Patterson 68 additional ones, all of which were operated upon; only 31 died, a mortality of 45.58 per cent. Tympany may be a factor in the production of perforation, as when it is excessive it causes immobility of the bowel, and the immediate exciting causes are, as a rule, mechanical and anything that causes sudden or unusual stimulation of peristalsis. Perforation may occur at any time during the disease, even in convalescence, but more than 70 per cent. occur between the second and fifth week. The ileum is the most common seat of the perforation, but apparently no portion of the gastro-intestinal tract is exempt except the duodenum. As a rule, there is only one perforation, but they were multiple in 31 cases, the size varying from a pinpoint to a fifty cent piece, or even larger. Scott has reported a case in which there were five perforations.

The symptoms which are of especial interest are, first, those which occur at the time of perforation, and second, those which occur later as the result of it. The first group of symptoms are usually absent. The sudden onset of abdominal pain is a point of importance; especially a constant pain which becomes more intense at intervals. A pain that is localized at first and later becomes general throughout the abdomen may be regarded as an indication of progressive general peritonitis. In over three-quarters of the cases these symptoms were masked by the mental condition of the patient. The classical fall of

¹ American Journal of the Medical Sciences, May, 1909, p. 660.

temperature seems to be the exception rather than the rule. Of greater frequency is a sudden rise of 1° or 2° F., followed by a slow persistent fall to normal or below over a period of eight or ten hours; in some cases there is no change. The pulse rate usually rises rapidly, and there are tenderness and rigidity and a change in facial expression, all of which are of the greatest importance in making the diagnosis. The question of examination of the blood is still a disputed point, and too much dependence should not be placed especially on isolated counts.

The later symptoms of general peritonitis are the same as those found from any other cause. The prognosis depends largely upon how soon the diagnosis is made and the operation performed, and it depends also upon the type of bacteria causing the peritonitis. When it is due to the streptococcus it is practically always fatal. Operation may be advised in all cases, no matter how late, unless the patient is dying. Typhoid fever patients stand operation, as a rule, very well.

With a view to studying the subject of perforation in children further, Jopson and Gittings¹ have collected the cases reported since Elsberg's paper in 1903.

They found that perforation in infants and very young children is relatively infrequent, as typhoid in the very young is not attended with the same amount of ulceration in the bowel as later in life, but from the age of four or five the intestinal lesions become of a character to favor perforation of the bowel.

In 2274 cases of typhoid fever in children there was perforation in 35, or 1.54 per cent. In some of the series of cases included in the collection the percentage was greater. The ages varied from five to fifteen years. The mortality was less in the younger children, a point which was previously brought out by Elsberg. As to sex, 28 cases were in males and 15 in females, which is not as large a difference in the sexes as was observed by Elsberg, in whose collected cases 18 were males and 6 females.

The incidence of typhoid in children, as collected from various sources, show that the proportion in 3071 cases was 1.17 per cent. in males to one female.

As a general rule, it may be stated that, the more severe the disease, and the more exhausted the patient, the worse the prognosis in cases of perforation, as they are less able to stand operative interference and subsequent complications.

The time of the perforation was definitely stated in 44 cases, the earliest on the ninth day, 11 in the second week, 12 in the third week, 6 in the fourth, 3 in the fifth, 4 in the sixth, 3 in the seventh, 1 in the eighth, and 1 in the ninth. These cases after the sixth week were almost all cases in which a relapse had occurred.

¹ American Journal of the Medical Sciences, November, 1909, p. 625.

Pain is the most important symptom; it occurred in practically all the cases, and as an initial symptom was noted in 87.5 per cent. In 89 per cent. it was stated as being severe, and in a little over half it was general in its distribution, while in only one-quarter of the cases it was confined to the right side of the abdomen, especially in the right iliac region. In some cases it was localized in the left side, sometimes in the upper and sometimes in the lower part of the abdomen. Tenderness was noted as being present in 36 out of 45 cases. It was noted as general in 15 of the cases. Rigidity was present in almost all of the cases, and in only one of the 32 cases, in which full data was given, was it noted as being absent. Vomiting was frequently present, and while it is a symptom of some value, it is not to be regarded in any way as characteristic. Distention was present in only 50 per cent. of the cases that recovered and 91 per cent. of the cases that died. It is of little value in the early diagnosis either in children or adults. Diminution of the liver dulness was sometimes noted, and as Elsberg has called attention to the fact that distention alone can cause diminution in the normal area of dulness the value of this diagnostic sign is greatly lessened. The presence of effusion in the abdominal cavity, as indicated by a movable dulness in one or both flanks, was noted in only 8 cases; when present, it is undoubtedly of value in the diagnosis, but is an extremely difficult thing to make out in children.

The authors are inclined to lay more stress on the initial drop of the temperature as a feature of significance in diagnosis than Elsberg, but one should note in this connection the extreme unreliability of changes in temperature in children as a feature in diagnosis. Chill was noted in 6 cases, and in view of the rarity of chill in uncomplicated cases of typhoid in children its occurrence during the second or third week should lead one to suspect the possibility of an impending or existing perforation. In the majority of cases the pulse showed an increase in the rate and a decrease in the quality. The facies does not give information of as great a value as one would expect. Shock was distinctly present in 10 out of 45 cases, and Elsberg has called attention to the fact that children seldom show the sudden symptoms of collapse that are so frequent in adults. Leukocytosis was often found present, but in the state of our present knowledge of leukocytosis in children, while it may be regarded as a confirmatory sign, its absence should not be taken as a negative sign.

The analysis of the deaths showed that there were 23 recoveries and 22 deaths, or a mortality of 48.8 per cent. In Elsberg's cases there were 16 recoveries and 9 deaths, or a mortality of 36 per cent. Combining these figures, the total mortality in children is 44.28 per cent.

The differential diagnosis must be made from appendicitis, which may occur in the course of typhoid fever, and when it does is not marked by the same degree of constitutional disturbance as is found in perfora-

tion. Hemorrhage may persist or follow a perforation, or may be mistaken for it. If pain is present it points to the existence of a simple hemorrhage. If pain and collapse are present, the possibility of perforation should be borne in mind, and points in favor of the hemorrhage alone are the absence of rigidity, marked tenderness, leukocytosis, vomiting, and chill. It occasionally happens that retention of the urine may cause severe abdominal pain, but the condition should be easily made out by percussion. Pneumonia or pleurisy on the right side very frequently produces severe abdominal pain, and the chest should be carefully examined in every instance in order to exclude this possibility. In some instances it is exceedingly difficult to say on first seeing the case whether or not there is some abdominal complication in connection with the pneumonia. From intestinal colic and distention the diagnosis is usually made by the absence of local and constitutional symptoms.

SPONTANEOUS RUPTURE OF THE SPLEEN IN TYPHOID FEVER. Bryan¹ reports a case of spontaneous rupture of the spleen during the course of typhoid fever, and has collected 24 other cases from the literature. He also notes that there have been 3 cases of rupture of the spleen during the course of typhus fever, and to these may be added 10 unreported cases of rupture during typhoid.

The spleen is, of course, always more or less enlarged in typhoid fever; sometimes it is enormously enlarged and so soft that it is remarkable that rupture does not occur more frequently than it does. As a matter of fact, we have no means of knowing if this is not much more frequent than is generally supposed, as the diagnosis is rarely, if ever, made during life. Cases may be mistaken for perforation and discovered at operation or at autopsy. Rupture has occurred most frequently at the beginning of the third week or later on during convalescence, and in the latter case it is doubtless explained by the increased muscular effort at this time. The spleen may rupture even if it is not very large, and when the rupture is a linear one the resulting hemorrhage is large and sudden.

The spleen should be palpated daily and a line marked on the skin to indicate its size. Care should be taken not to handle the enlarged spleen of a typhoid fever patient roughly. If rupture occurs the swollen spleen is smaller than it was, the outlines irregular, or it cannot be made out at all. Previous to the rupture many patients complain of pain under the left costal margin, but after rupture occurs pain may or may not be present and is of little value in making the diagnosis. After rupture has taken place there is a large hemorrhage into the peritoneal cavity, with the usual symptoms of rapid, weak pulse, dyspnea, restlessness, and the facies of shock. The temperature is high, the abdominal

¹ *Annals of Surgery*, November, 1909, p. 856.

wall hard and tympanitic, while the percussion note may be flat in the flanks. Bryan suggests that if there is shock, with a rapidly rising temperature and no absence of liver dulness, a tentative diagnosis of rupture of the spleen might be made.

The treatment is surgical, immediate operation giving the patient the only possible chance of recovery. In the total of 38 cases of rupture in typhoid, which includes three in the course of typhus, the diagnosis was not made in any case, and all died.

Bryan makes the suggestion, to which one can hardly agree, that, in the course of the operation for intestinal perforation, if the spleen is found soft, large, and like a bag of molasses, it should be removed.

TYPHOID FEVER OF SHORT DURATION. Coleman,¹ from a study of the cases of typhoid in the Bellevue Hospital, concludes that many of the fevers lasting under three weeks, which were formerly diagnosed as bilious fever, gastric fever, simple continued fever, and similar indefinite appellations, are, in reality, short duration typhoid. He urges the necessity of the study of these mild cases of fever, with a view to their being typhoid, and is of the opinion that improper diagnosis in these cases is responsible for the spread of the disease in many instances. He proposes the name short duration typhoid for the mild and ambulatory cases which last under three weeks.

The literature on this subject is very meagre considering its importance, and in many places there is a common belief that typhoid fever must last three weeks or more, and this has doubtless led to many mistakes in diagnosis. It is a good general working plan to regard every continued fever not otherwise perfectly explained as a possible case of typhoid.

OX GALL AS A CULTURE MEDIUM FOR THE TYPHOID BACILLUS. Bettencourt and Regalla² have used a new method of diagnosis, which consists in making blood cultures, using Conradi's culture medium, which is a mixture of bile, glycerin, and peptone. The blood was taken from one of the veins at the elbow by means of a syringe, and if the result was negative the examination was repeated for six consecutive days. They obtained a growth of typhoid bacilli in every one of the 11 cases examined during the first week of the disease; 14 out of 17 examined during the second week; and in the third week they could only obtain the cultures from half their cases. The typhoid bacillus grows best in bile when half the quantity of blood is added to it, and it has the advantage that it may be kept for a day or over before being placed in an incubator. This method seems to be worthy of further study, and if these observations are confirmed it would afford a reliable method of making the diagnosis in the first week of the disease.

¹ American Journal of the Medical Sciences, June, 1909, p. 781.

² Jornal da Sociedade das Sciencias Medicas, Lisbon.

THE ISOLATION OF THE TYPHOID BACILLUS. Jackson and Melia¹ have devised an ingenious method of isolating the typhoid fever bacillus from water, milk, or other sources. Their method is to use a mixture of bile and lactose, as in bile the only bacteria that will grow freely are typhoid and colon bacilli. When lactose is present the colon bacillus causes a copious gas formation, and soon produces sufficient acidity to retard its own growth. This results in the predominance of the typhoid bacillus, the growth of which is not materially affected by the acidity. The cultures are then plated in Hesse agar, upon which they produce very characteristic colonies from which cultures may be obtained for confirmatory tests by other methods.

Conradi² has also devised another ingenious method for determining the presence of the typhoid bacillus when they are present in very small numbers. Certain aniline colors exercise an antiseptic action on a large number of bacteria, leaving nearly intact the typhoid bacilli. Conradi, after having studied 400 different aniline colors, decided that picric acid and crystal brilliant green (Brillant-Grün Krystall) gave the best results. These are added to the culture medium in the proportion of 1 to 15,000 and 1 to 150,000. In the brilliant green media the typhoid gives clear green colonies, transparent, with rounded edges, more thick at the centre than at the periphery. The colonies of the paratyphoid are a little larger, and their color is a yellowish green. The colon bacillus does not grow in this media, and there are very few others that are capable of developing on it. Those that will grow on it are not easily confused with the typhoid bacillus.

THE OPHTHALMIC TEST IN TYPHOID AND COLON INFECTION. In 1907 Chantemesse demonstrated that the conjunctiva in typhoid fever patients was susceptible to the toxic products of the typhoid bacillus, and that the reaction obtained was specific. The toxic product was made by cultivating virulent typhoid bacilli for eighteen hours, making the mixture in sterile water and sterilizing at 60° C. The solution was then centrifugalized and the organisms dried and triturated. This triturated product was then suspended in water and allowed to stand for three days. The disintegrated organisms were then removed and the extract precipitated with alcohol. The precipitate was then dried and dissolved in sterile water with the strength of 2 milligrams to one minim. This is instilled in the conjunctival sac, and within three hours there is diffuse redness. The reaction reaches its height in from six to eight hours and lasts about twenty-four hours. When there is no typhoid fever a slight infection of the conjunctiva may appear, which disappears in a few hours.

Floyd and Barker³ were unable to make this toxic product so that

¹ Journal of Infectious Diseases, April, 1909, p. 194.

² Centralblatt für Bacteriologie.

³ Journal of Medical Research, January, p. 95.

it would produce a satisfactory reaction, and have suggested using Hamburger's method, which consists of growing typhoid bacilli on agar for twenty-four hours, washing the growth off of the media with physiological salt solution and incubating this for four days. At the end of this period the solution becomes partly clear, and it is then sterilized at 60° C. for half an hour. This is centrifugalized for twelve hours and the clear supernatant fluid pipetted off into sterile tubes. A solution is made of the strength of one billion per cubic centimeter, and for children one half this strength gives reliable results. The solution retains its strength for several weeks and then gradually grows weaker until nearly inert.

They tried this reaction in 93 cases, nearly all of which had been proved by the Widal or blood culture, and all but 2 gave a well-marked reaction in about four hours. In 24 control patients, 4 gave a well-marked reaction, and these were all tuberculous cases. In 3 cases having clinical symptoms of typhoid, but not proved by the Widal test or by blood culture, the eye reaction was positive. The failure of the 2 proved cases of typhoid to give this test they explained by the failure of the body tissues to become sensitized to the typhoid toxin. In the tuberculous cases that reacted the possibility of a previous persistent gall-bladder infection with the typhoid bacillus must be borne in mind. The well-marked reaction was found only during the active period of the disease. In cases of convalescence, after the temperature had reached normal the reaction was not obtained, or it was very slight.

Where relapses occur the reaction may again be obtained. The reaction is frequently obtained several days before the Widal or blood cultures, and in doubtful cases should make a valuable method of diagnosis.

The solution does not keep very long and should only be prepared in a well-equipped laboratory by a careful bacteriologist. The possibility of the production of severe inflammations of the eye should be borne in mind, but thus far no cases have been reported.

Similar reactions were made with the colon bacillus in cases of colon infection. The reaction lasted about twelve hours and disappeared entirely at the end of twenty-four hours. Only 7 cases were available, and 6 of these showed the reaction. It has not been found necessary to use the strain of organism isolated from the patients to obtain these tests. The authors have also experimented with the pneumococcus, but were unable to obtain any reactions.

THE HEMOLYTIC TEST FOR TYPHOID. Following the announcement of the Bordet-Gengou method, which has been applied so satisfactorily to the diagnosis of syphilis by Wassermann, Neisser, and Bruck, the principles of which have been given above, the same method has been applied to many other infectious diseases, and to typhoid by Widal

and Le Sourd.¹ They investigated a number of cases during the fever period with positive results, and their work was followed by investigations by many other observers.

One of the most recent articles is the contribution by Zlatogoroff,² who found that the reaction can be used with great success in the diagnosis of typhoid, is very specific, and gives earlier and more exact results than the agglutination test; the immune bodies or amboceptors appear in the blood earlier, increase more rapidly and also disappear more quickly than the agglutinins. Just as in the case of the agglutination test, so with the complement fixation, he found that the results were often more intense and more clear with diluted serum than with the concentrated.

Two methods may be used, either that of Bordet-Gengou or that of Wassermann. In the first method as antigen a one-day-old living culture is used, and in the second method an extract of this is employed. The Wassermann method gives more exact results. Five ingredients are necessary in performing the reaction—first the antigen, which Zlatogoroff prepared by washing a one-day-old agar culture of typhoid bacilli with normal salt solution, killing this by exposing to 60° C. for one hour, then placing it seven days in the thermostat and then filtering. This filtrate may be preserved in little glass ampullæ, and loses but very little of its strength even after several months. The second element is the serum to be tested, which is, of course, the serum taken from the patient. The third element, or complement, is guinea-pig blood. These three are mixed together and are placed in a thermostat at 37° C. for one hour, and then the fourth and fifth elements are added, these consisting of red blood corpuscles from sheep and a hemolytic serum, either the blood from a pig which is naturally hemolytic, or the serum of a guinea-pig which has been rendered sensitive to the red blood corpuscles of a sheep. This entire mixture is allowed to remain in the thermostat for two hours and then placed in the cold for twelve hours. If hemolysis takes place it shows that the reaction is negative, as the amboceptors were not used up in completing the bacteriologic reaction.

This test was thoroughly tried on 41 cases of typhoid and also on 20 other cases, some healthy and some suffering with various other diseases. There were 38 positive results out of the 41 cases of typhoid. In one of these cases the diagnosis was doubtful; the other 2 turned out to be cases of influenza. In the other 20 cases the results were uniformly negative.

The reaction is particularly valuable, because it may be obtained earlier than the agglutination test, being found on the fourth, fifth,

¹ Société Médicale des Hôpitaux, 1901.

² Centralblatt f. Bacteriologie, September 25, 1909, p. 587.

sixth, seventh, and eighth day in cases in which the agglutination test was negative. It is also important to use as antigen the paratyphoid bacillus in order to make a diagnosis of this condition.

ANTITYPHOID INOCULATION. Antityphoid inoculation has been very thoroughly studied since 1896, when Pfeiffer did the pioneer work upon it. Wright placed the method upon a firm basis by his inoculations in the British Army, both in India and during the Boer War, and since then there have been numerous contributions on the subject, especially by Leishman. The method has been approved by the Royal College of Physicians and the Royal Army Commission.

Stone¹ has reviewed briefly the methods used and has given some interesting statistics.

The latest statistics are those of Leishman.² These statistics cover a period of three years and a half, from the beginning of 1905 to June, 1908. In 5473 soldiers vaccinated against the disease 21 took it and 2 died; in 6610 soldiers practically under the same conditions, who were not vaccinated, there were 187 cases and 26 deaths, that is, among the vaccinated soldiers there were 3.8 cases per thousand, and among the non-vaccinated 28.3 per thousand. The method used consists of injecting from 5,000,000 to 5,000,000,000 dead typhoid bacilli at a time; the best results were obtained by repeating this injection ten to fourteen days later. The injections are given subcutaneously, usually on the outer side of the upper third of the arm near the insertion of the deltoid, or subcutaneously in the abdominal wall. The site of the injection usually becomes reddened, and may be slightly tender, but this disappears in twenty-four hours. As a rule, no symptoms whatever are produced, though occasionally in a hypersusceptible subject there may be a feeling of malaise, headache, and even slight fever.

The inoculation should be avoided if possible in individuals during the incubation stage of typhoid, although the reasons for this, as Stone points out, are more theoretical than real. The method is of practical value in protecting armies, and some of the English medical journals have suggested that young persons going to countries where typhoid fever is prevalent should avail themselves of this valuable means of prophylaxis.

Castellani³ finds that he can produce a higher degree of immunity by using *live typhoid vaccines* prepared by a method of his own, which consists of heating non-virulent broth cultures at 50° C. The use of this vaccine is free from danger. He recommends, first, the vaccination with the dead bacilli, using Wright's method, and following it in one week's time by an inoculation of one cubic centimeter of his live vaccine. He also suggests the possibility of using mixed vaccines in typhoid and

¹ Journal of the American Medical Association, October, 16, 1909, p. 1253.

² Journal of the Royal Army Medical Corps, February, 1909, p. 163.

³ Centralblatt f. Bacteriologie, October 18, 1909, p. 92.

dysentery or paratyphoid and dysentery, but this latter suggestion, while it works out in the laboratory animals, requires further investigation before its use could be recommended in man. Castellani states that he has used such vaccines, but does not state what results he obtained, consequently it may be inferred that they were not favorable.

Uncinariasis. THE PREVALENCE OF UNCINARIASIS. The general interest that has been aroused in the occurrence of hook-worm, and of its effect on the general health, has given rise to numerous investigations, among which may be mentioned those of Chamberlain, who has made a study of the occurrence of the hook-worm in the soldiers at the Jackson Barracks, Louisiana. He made a systematic study of 100 southern-bred soldiers, or, in other words, men who were born, or who had always lived, in some one of the following States: Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Kentucky, Tennessee, Arkansas, and Missouri; 60 per cent. of these showed the presence of uncinaria. Among the new recruits the percentage of infections was at times as high as 85 per cent., while after more than three years' service there is much lower, amounting to 11 per cent. Under the favorable sanitary conditions maintained in the army reinfection rarely occurs and the worms gradually die out, most of them during the first three years. The symptoms produced by a light infection are so slight that they cannot be detected by the usual methods employed by the examining surgeons, and the diagnosis must be made by microscopic examination. These light cases undoubtedly act as carriers and serve as a menace to the remainder of the troops. From the standpoint of prophylaxis it is exceedingly important to treat all mild infections, even though the patient's health itself does not demand it.

A NEW METHOD OF THE EXAMINATION OF THE FECES FOR THE DETECTION OF THE OVA OF THE UNCINARIA. A new method of examining stools for the uncinaria which greatly simplifies the work of searching over a number of slides has been suggested by Pepper,¹ who has observed that the eggs of the uncinaria differ from all other parasites' eggs in having a somewhat sticky covering, so that they will remain stuck fast upon a glass slide. Preparations from the centrifugalized washed stools are placed upon microscopic slides, and after a few moments, to allow sedimentation, are washed off with water. The eggs of the uncinaria remain stuck to the glass and are very easy to find under the microscope.

Whooping Cough. THE MICROBE OF WHOOPING COUGH. Bordet and Gengou² have made a report of their work with the whooping-cough bacillus, notes about which have been already published during the

¹ Journal of Medical Research, 1908, p. 75.

² British Medical Journal, October 9, 1909, p. 1062.

last two or three years in the *Annales de l'Institut Pasteur*, 1906, p. 731; 1907, p. 721.

The organism is found in the mucus from the respiratory tract, but chiefly from the remoter parts, more often below the larynx than above it, and it is more abundant at the beginning of the whooping period than it is later on. If cultures are taken only from the upper parts of the respiratory tract numerous bacteria of secondary infections are found, and the whooping-cough bacillus may be overlooked. The germ grows very slowly in the first cultures, two or three days elapsing before colonies appear, and, unless there is an almost pure culture, will be overgrown by extraneous organisms.

The best medium consists of defibrinated human or rabbit blood mixed with an equal quantity of 3 per cent. agar containing a little extract of potato and glycerin. The organism is a small coccus-bacillus resembling the bacillus of influenza, and in continued cultures becomes so small as to be merely a point even under the highest powers of the microscope. On blood agar it shows a fairly thick whitish streak, the adjacent blood being hemolyzed but not blackened. The organism also grows well in liquid media if shallow vessels are used, so as to offer a large contact with the air.

The ordinary laboratory animals are not much affected by this microbe, but Klimenko and Fraenkel claim to have produced real whooping cough in monkeys.

The observers have made a study of the toxin-producing properties of the germ, and have succeeded in extracting an endotoxin. The injection of small quantities of this produces fatal results, with the same hemorrhagic and exudative lesions which follow the injection of the living germ. It is very likely that the persistence of the irritating symptoms are due to the presence of this toxin, the body getting rid of the organism comparatively early in the disease. The organism produced in cultures differs from that obtained from the patients in regard to the Bordet and Gengou reaction. They have suggested the use of a vaccine in the treatment of cases of whooping cough, and Freeman, of London, has tried this quite extensively, and found uniformly better results where it was used than in the control cases. The best sized dose has not yet been determined.

Bordet's work has been confirmed by various other observers, as Arnheim, C. Fränkel, and more recently by Seiffert.¹ This last observer confirmed in every way the previous work, both in regard to finding it in the cases and also to the complement fixation test, and he is inclined to believe that further investigation will prove this organism to be the true cause of whooping cough.

Some observations have been made on the bacillus by Martha Woll-

¹ *Münchener med. Wochenschrift*, January 19, 1909, p. 131.

stein,¹ who found the organism present in the sputum of early cases of pertussis and also in the lungs at autopsy in fatal cases of the disease. She was unable to isolate it after the second week in most cases. She got negative results in the complement deviation tests, which she was unable to account for, as other observers have demonstrated this. She concludes that her studies support the view that the Bordet-Gengou bacillus is the possible cause of pertussis, but that she is unable to produce any new evidence beyond the widespread dissemination of the whooping-cough bacillus and its occurrence in the disease. There have been no extensive studies made of the bacillus in its relation to other diseases of the respiratory tract, but it would seem to be a matter of importance and one which Wollstein expects to report on later.

WHOOPING COUGH FROM THE POINT OF VIEW OF PUBLIC HEALTH. Grandby² calls attention to the fact which is usually overlooked by the physicians and laity in this country, and that is the great danger from whooping cough. Whooping cough is rarely fatal in children over five; in fact, 96 per cent. of those who died from this disease in 1906 were under five, so that physicians should bear in mind that if they can guard their young patients against infection until after this age they will stand a much better chance of recovery than if they take it early. The second point is that the patients usually die from some terminal complication, usually pneumonia, and that many deaths really due to whooping cough are reported under some other disease. The death rate is much lower in the United States than in European countries, but it may be noted that in New York City in a period of ten years there were 3200 deaths from whooping cough and but only a few more, 3430, from typhoid.

Grandby believes that the only solution of the problem is to have a well-organized movement against whooping cough, and that the cases should be reported, the houses placarded, and a medical inspector sent to the house to give instructions, especially regarding the seriousness of the disease in young children and how to prevent its spread. The children who are allowed in the streets or in the parks should wear ribbons bearing the word "whooping cough," to serve as a warning for other children, and that especial care should be taken to prevent the return of children to school too early, and also to prevent the incipient cases from going to school.

THE BLOOD IN WHOOPING COUGH. Ever since Fröhlich, in 1897, called attention to the leukocytes in whooping cough, clinicians have paid more or less attention to this as an early diagnostic sign. The subject has been carefully studied by a number of different observers, and all are agreed, in a general way, on the changes that take place.

Kolmer³ has made a careful study of the blood in whooping cough

¹ Journal of Experimental Medicine, January, 1909, p. 41.

² Journal of the American Medical Association, June 26, 1909, p. 2091.

³ Archives of Internal Medicine, July 15, 1909, p. 81.

in children in institutions for orphans. In the pre-catarrrhal stage there is slight leukocytosis, with an absolute increased percentage of all forms of white blood cells. This increases during the catarrhal stage, reaches the climax in the paroxysmal stage, then the number decreases until, as Barach has stated, they reach normal in a little over three months.

The lymphocytes follow a similar course and can in almost all cases be made out in the catarrhal stage. The large mononuclears have a more irregular course, and a large percentage was generally found when the number of small mononuclears was high, and the large percentage remained longer than that of the small mononuclears.

The transitionals run a very irregular and unimportant course.

The percentage of polymorphonuclear neutrophiles is usually increased, but relatively they decrease as the lymphocytes go up.

The eosinophiles are present in normal proportions in the catarrhal stage, are relatively decreased in the paroxysmal stage, and there is a mild eosinophilia in the postparoxysmal stage.

The basophiles have a slightly higher percentage than normal throughout the disease.

In connection with the study of the blood, Kolmer made a large number of counts on normal institutional children, and concluded that the number of leukocytes does not change materially up to five years of age. They are liable to be lower in artificially fed infants than in healthy breast-fed infants of the same age, and unless the count is over 12,000 per cubic millimeter, young children are not regarded as having leukocytosis.

The percentage of lymphocytes is generally lower in children living in good homes, and decreases as age advances. A fair percentage of basophiles was found, which was an observation of interest, as these are generally absent in the blood of healthy children.

THE TREATMENT OF WHOOPING COUGH. Czerny¹ considers that the nervous element in whooping cough has received too little attention, and believes that the treatment could be directed primarily against this. He also advises a change from drugs to hydrotherapy, inhalations or irrigations of the nose, and believes in the isolation of the child, particularly where it may be changed from its ordinary surroundings. It should not be allowed to see or hear other children with a cough. He believes that a child can be safely isolated by transferring it to another ward where there are no other children with whooping cough, and it has been his experience that the disease is not transmitted from a child kept in bed to the neighboring patients. One would hesitate to advise placing a child with the disease like whooping cough in the midst of uninfected children, certainly unless the personnel of the institution was very much better than it is in the average hospital and infant asylum in this country. While it is not generally believed that

¹ *Therapeutische Monatshefte*, Berlin, vol. xxii, No. 12.

whooping cough is transmitted any great distance from the patient, children are very liable to crowd around the bed of the patient unless there is an attendant constantly on hand to prevent this. The presence of one child with a nervous cough may cause imitation by the other children. There is undoubtedly something in the treatment that Czerny suggests, but generally where it is needed it is impossible to secure it.

Another suggestion regarding the treatment of whooping cough is that of Senftleben.¹ He believes that antipyrin and quinine will either abort or greatly weaken pertussis. He advises giving one gram of antipyrin dissolved in 25 grams of warm water and injected by rectum three times a day. This dose is for children of twelve or over, and for younger children proportionately smaller doses should be used. He states that when commenced early the disease is frequently aborted. With this one quickly dissents, as practical experience with antipyrin or any of the other drugs used in the treatment of whooping cough demonstrates that they do not cut the course of the disease short. The use of antipyrin, especially in otherwise strong children, is one of the best agents we possess, but the effect is to lessen the number of paroxysms and perhaps to make them a little less severe. As a rule, antipyrin administered by the mouth does not interfere with either the appetite or digestion, unless used in too large quantities or over too long periods of time. It should always be used with caution and omitted at stated intervals. Weakness, faintness, weak pulse and heart, and cyanosis are contra-indications to its use.

Heroin is found of great service given in proper-sized doses, but the drug above all others that will give the best results over the longest periods of time, and one of the safest drugs, is belladonna, either the tincture of belladonna or a solution of atropine sulphate. The method of administration is all important, as the best results are only obtained by the following procedure: The drug is given every three or four hours and kept up over considerable periods of time. The dose must be regulated according to the individual, starting with a small dose, which is gradually increased until the point is reached where flushing of the face comes on fifteen or twenty minutes after the administration of the drug. If the tincture of belladonna is used, the dose may now be diminished one drop, or if atropine sulphate is used, it may be diminished by about $\frac{1}{1000}$. This sized dose is to be used, and if it should cause flushing at any time the dose should be reduced still further, the point being to give the drug just short of its producing some manifest action. Quinine is useful in older children, but often causes vomiting, and does so almost uniformly if given in sufficient doses in young children.

¹ Deutsche medicinische Wochenschrift, January 14, 1909, p. 49.

THE DISEASES OF CHILDREN.

By FLOYD M. CRANDALL, M.D.

THE right of the baby to be comfortable is the text of an admirable paper by Eaton,¹ of Pittsburg. He asserts the very fundamental principle that it is the right of every infant to live, to grow, and to be comfortable. To the attainment of these objects one rule should be enforced from birth, namely, regularity or the cultivation of accurate habits. The baby who is taught to employ its various functions at fixed and convenient times is the most contented and comfortable baby. Regularity as to feeding and sleeping should be urged upon every mother and nurse as being the means by which the most comfort can be secured for all concerned.

The strong modern trend toward preventive medicine is evinced by the chairman's address before the Section on Diseases of Children of the American Medical Association, in which Dr. Southworth considers the field for prophylaxis among children. He asserts that the well-equipped practitioner of medicine today is, in fact, a many-sided specialist. The passing of the old-time family physician and the threatened usurpation of his position by the specialist, which was the subject of comment a few years ago, no longer attract attention. The relation of the physician to the family is still maintained, and a knowledge of the specialties has become the common property of all well-informed practitioners. This is particularly true of pediatrics. The number of strict specialists is few, and the children of the land are treated by the family physician and general practitioner. Dr. Southworth's address was clearly prepared in recognition of this fact, and the same is true of the greater part of the articles upon pediatrics which appear in the medical journals.

Infantile Mortality. The subject of mortality in infants and young children has recently received earnest consideration in Great Britain. An important deputation from the national conference on infantile mortality was recently received by the Prime Minister,² which urged particularly the necessity of a government analysis of all preparations sold as food or drugs for infants. The education of teachers of the secondary and elementary schools in matters of hygiene was also urged. The death rate in children under five years has been reduced from

¹ Archives of Pediatrics, September 9, 1909.

² Journal of the American Medical Association, March 20, 1909.

57 to 41 since 1900, and is attributed in large part to the active efforts to improve the conditions surrounding young children.

The mortality of the children of women employed in cigar factories has for some time attracted notice. Researches have recently been published¹ which show it to be a fact that the rate of illness as well as death in such children is unusually high. Irregular nursing and artificial feeding are among the causes. Breast-fed infants of such mothers appear to receive a less plentiful supply of nourishment than do ordinary children. The composition of the breast milk, however, shows no material alteration, and nicotine has not been found.

Some extended observations on the causes of infantile mortality during hot weather are reported by Finkelstein,² who found that the mortality curves followed very closely the daily temperature curves. Almost invariably the number of extremely sick children admitted to the hospital after an extremely hot day was very large. He believes that many of these cases were due to actual heat stroke, as the results followed too closely upon the heat to be attributed to bacterial influence. The greater number of cases of illness and of death, however, are apparently due to subacute digestive disturbances. These are brought on by the hot weather, but may continue after the weather has moderated. The mortality rate, therefore, does not follow the temperature curves. As children have less tolerance for cow's milk than for breast milk, it is not strange that artificially fed children are those which suffer the most during the summer, even if the possibility of contamination of the food is eliminated.

A very interesting comparison of infant mortality in the past and present is made by Stowell, of New York.³ One of the most important causes of high mortality among infants is overcrowding. The rate increases more than in the case of children and adults. Tables presented by Stowell seem to demonstrate this conclusively. It does not, however, necessarily follow that a dense population is an unhealthy one. This is proved by the experience of the "Ansonia," the largest apartment hotel of New York, which houses two thousand persons, with a density per acre of 1262. During the first seven years of its existence no infant died there and none of the employees contracted tuberculosis. This demonstrates that it is possible to have a dense population with a low death rate when the hygienic conditions are good. In this case it must be noted that the population is scattered over sixteen floors, giving twenty-six acres of actual space.

The character of the food, whether natural or artificial, is also of great importance. Figures are presented by Stowell which show that of children dying of diarrhea, 6 per cent. were nursed, while 36 per cent.

¹ *Simomini la Pediatria*, March, 1909.

² *Deutsche med. Wochenschrift*, August 12, 1909.

³ *New York Medical Record*, May 22, 1909.

were fed on cow's milk and 30 per cent. on condensed milk. It has frequently been asserted that infanticide as a result of child insurance is an appreciable cause of infant mortality. One great insurance company of New York has 800,000 children under ten years of age on its lists. This company, as well as two other great industrial insurance companies, asserts that not a single death has been brought about in this country by reason of insurance. It is a notable fact, however, that insurance of children does not begin in this country until the child is at least one year old, while in England children are insured almost from birth. The experience of the Metropolitan Company has been only 49 deaths per thousand at two years, while Farr's table would indicate 65 as the average. It would certainly seem that in this country insurance cannot be a factor in child mortality.

Of the infectious diseases which cause death among infants, typhoid fever has somewhat declined; measles and scarlet fever remain the same. Whooping cough, dysentery, and diphtheria are less. Deaths from pulmonary tuberculosis have diminished slightly, but not so markedly as in adult practice. Deaths from violence have greatly increased.

The prevention of infant mortality has received much attention of recent years, as is proved by the fact that day nurseries have been established in all the large cities, New York having 62, London 55, and Paris 66. Madame Coulette's restaurants for nursing mothers have proved of great value in Paris. The New York Department of Health, Bellevue, and other hospitals send out nurses to instruct the mothers wherever there is a newborn infant. The city and country homes have accomplished great good. Municipal campaigns for reducing infant mortality are urged by Newmayer,¹ of Philadelphia. Among the most important features of such campaigns are the education of mothers, the securing of clean, fresh milk, the education of midwives, and the employment of special physicians and nurses. Every large city needs as an addition to its health bureau a department of child hygiene—similar to the one existing in New York—for the purpose of studying and planning for the health of children and infants. The work of physicians, health officers, organizations, and societies should not overlap. There should be coöperation, and this can only be done by having one central branch or clearing house, with a proper systematic division of labor. Mothers' associations are valuable aids in the campaign.

Care of the Newborn Infant. Because of the small amount of attention paid to the infant at birth, it seems to belong neither to the obstetrician, the general practitioner, nor the pediatricist, but rather to the nurse or the first unemployed person who happens to be in the room, to whose tender mercies the child is given as soon as it has demonstrated its ability to breathe. Tuley² urges greater attention to the infant during

¹ New York Medical Journal, October 23, 1909.

² Archives of Pediatrics, August, 1909.

the first few days of life than it commonly receives from the practitioner. He approves the Credé treatment of the eyes or the use of one of the newer salts, but prefers the original 2 per cent. solution of nitrate of silver. A drop of the solution is placed in each eye, followed after a closure of the lids by a few drops of normal salt solution. The maintenance of the bodily heat is of importance in all children, and particularly in the weak and feeble. A rubber or elastic ligature, Tuley believes, is the best material for tying the cord, the next best being linen tape. Fine silk is unsafe. The cord should be inspected several times during the first two hours. A protective dressing should be applied, for the possibility of infection through the cord should always be remembered. One of the best dressings is a solution of 30 minims of balsam of Peru to an ounce of castor oil. This is best applied on a pad of gauze two inches square, with a hole cut in its centre. A dry piece of gauze, slightly larger in size, is placed over this, and is held in place by a binder. This dressing should not be disturbed except to apply a small amount of the balsam and oil until the separation of the cord, which, in the majority of instances, will take place about the fifth day. It is an exception to find anything but a smooth, dry base at the navel when the cord has separated after the use of this dressing. It leaves a soft, pliable stump, unlike the hard, sharp-pointed one which often results from a dry powder dressing.

The child should be thoroughly anointed with some oily substance. When the first bath is given the disintegrated vernix can be removed with a soft piece of gauze and a little soap. After the bath the child is dressed and given to the mother, and if a primipara, both baby and mother are instructed in the first nursing. This proceeding is apt to be wearisome to everyone concerned, but if persisted in faithfully for the first two or three nursings there is usually no further trouble. If the breast is large and flabby, the possibility of the child being asphyxiated from burying its nose in the soft gland must be borne in mind. The mother must be instructed how to lie, how to place the baby, and to use one finger to hold the breast away from the baby's nose. The question of nourishment of the baby is the most important to be solved in connection with the newborn. During the first three days the breast secretes but little fluid, and no milk until the end of the second or sometimes the third day. If this is borne in mind much trouble with the nipples will be averted. The child should be put to the breast every six hours during the first twenty-four hours, every four hours during the second day, every three hours during the third day, every two hours during subsequent days, and twice at night. This infrequent nursing during the period when the breasts are practically empty following the first nursing, when the colostrum is drained away, is as effectual as anything possibly could be in preventing cracked, eroded, and fissured nipples. Pulling and tugging at a practically empty breast is one of the most frequent causes of this annoying complication.

A diminishing supply of breast milk can often be increased by a careful regulation of the diet of the mother, prescribing one which, as Southworth has suggested, consists largely of milk and cereal gruels or porridge. Tuley has seen a decided increase of milk following hyperemia produced by Bier's method. A bell-jar must be used which will include the entire breast, and the vacuum just short of pain continued for at least thirty minutes twice during the day. Should artificial feeding be necessary, as carefully written directions must be given for the preparation of the food as would be for the preparation of a prescription for medicine. A good wet-nurse should be provided, if possible, but it is well known how difficult these are to obtain. Cow's milk is the next best substitute, and it must be carefully modified to meet the needs of the individual child.

Constipation is a common condition of the infant from the third or fourth month, and is largely due to the conformation of the sigmoid and colon. The sigmoid in the infant is long in proportion to the length of the colon, and the mesosigmoid is longer than it is in later life. Hence this portion of the bowel is often beyond the median line of the abdomen on the right side, and as it is the reservoir for the fecal accumulation of the intestines until the bowel contents reach the rectum, there is no passage of fecal matter. No change of diet will accomplish regular daily evacuations, and they must be secured by the administration of daily enemas, or the alternate use of enemas with glycerin or soap suppositories. As the child grows with lengthening of the abdominal cavity and deepening of the pelvis, the descending and transverse colon lengthen at the expense of the sigmoid. The sigmoid becomes much straighter than before, and unassisted movements from the bowel are more frequent. The futility of administering purgatives is thus explained.

The eczematous condition of the skin of the buttocks is the result of allowing evacuations of bladder and bowel to remain long in contact with the skin. Because of the very sticky nature of meconium, it is difficult to remove from the skin when it dries, and roughness in cleansing the skin may result in a trauma, the starting point of this eczematous process. No soap should be used on the buttocks. The discharge should be removed by a soft cloth and water, the skin carefully dried, and a bland, unirritating, and unscented powder applied. The application of stearate of zinc powder upon the first appearance of redness of the skin is of great value. Another common occurrence is to find an eczema of the skin limited to the area covered by the napkin. This is due usually to the irritating effect of the dried urine in the napkins, from the custom so prevalent of using the napkins several times before they are washed. Prophylaxis by only using napkins which have been washed is essential.

Every newborn baby should be provided with a bassinet, unrockable cradle, or crib, and under no circumstances allowed to sleep with its

mother. An ordinary clothes basket, with a pillow for a mattress, makes an excellent bassinet. If the child sleeps with the mother the temptation to nurse it whenever it cries is too great, and the mother is liable to fall asleep while doing so. The child lies for hours with the nipple in its mouth, nursing intermittently. The French national law prohibiting the custom of infants sleeping in bed with the parents is an excellent one. This was passed to prevent the accident of overlaying the child, which is a possibility to be reckoned with. Tuley speaks strongly against the practice of indiscriminate circumcision of male infants. The foreskin has its special function, and if proper attention is given to it when the child is one month old, no subsequent trouble will arise.

Tuley speaks also against the custom of enveloping the child in a snugly, and often a very tightly, applied abdominal binder after the separation of the cord. The only purpose a binder serves is to prevent an injury being done a cord before it separates. The baby unquestionably needs a protective covering over the abdominal organs during the first two years of life, and this can be obtained best by a woven, sleeveless binder with short tapes before and behind, which are pinned to the napkin, thus keeping it closely fitted to the body. It is worn under the shirt, and gives the proper protection to the abdomen without causing pressure.

The temperature of the baby should be taken in the rectum with the same regularity as the mother's is taken during the puerperium. During the first week there is very apt to be a rise ranging from 101° to 105° . This rise has been variously explained. By some it is attributed to sepsis, by others to starvation. So many babies are relieved of this fever by a little artificial feeding, especially when the mother's milk is slow in coming, without any therapeutic remedies, that it is difficult to believe that sepsis is the cause. Associated with fever in these cases is restlessness, constant drawing up of the legs, crying, hot, dry mouth and skin. Two complications in infancy are usually evidence of carelessness on the part of the nurse, viz., thrush or sprue and intertrigo. Both of these conditions are preventable. The *Saccharomyces albicans* develops in the mucous membranes of the mouth of the infant, and can be inhibited by the regular use of a solution of boracic acid. Great care and gentleness should be exercised in the cleansing of the mouth.

Asphyxia Neonatorum. A series of twelve or more prize essays on this subject¹ contains many excellent articles. Teah, of Renovo, refers to the two forms of asphyxia, viz.: (1) *Asphyxia livida*, that condition in which there is an accumulation of carbon dioxide in the blood, yet circulation and reflexes persist; (2) *asphyxia pallida*, an advanced stage of the former, characterized by weakness of the heart, a slowness

¹ New York Medical Journal, December 26, 1908, to January 23, 1909.

of pulsation, and an abolition of reflexes. In this last condition the prognosis is very unfavorable. The prognosis of asphyxia neonatorum in general depends upon the heart action, for as long as the heart continues to act there may be some hope for resuscitation.

Ela, of East Douglass, to whom the first prize was awarded, says that the prevention of asphyxia might properly extend to the entire art of obstetrics. The treatment should aim to clear the air passages, secure inflation of the lungs, and preserve and increase the child's vitality. The most certain method of filling the lungs with air is by direct inflation through a catheter passed into the larynx. Mouth-to-mouth inflation results in distending the stomach. In either method the nostrils should be closed. Artificial respiration by flexion and extension of the body is also effective. The Schultz method is one of the most effective of the flexion methods. In case the reflexes have not been abolished, the application of cold to the skin, slapping the buttocks, blowing in the face, tickling the throat, any of them may arouse the breathing reflex. Most effective is the exploration of the anus with the finger. One or two tablespoonfuls of blood may be allowed to escape from the cut cord if it seems necessary to relieve the circulation. These methods will generally be successful in simple asphyxia with a blue skin, bounding heavy pulse, and good muscular tone.

But sometimes a child is born in a state of shock. As the body is delivered into his hands, the attendant will perceive the flaccidity of the limbs before his eyes recognize the cutaneous pallor, which may not be evident at first. All methods of resuscitation which depend upon the excitability of the reflexes will fail in such a case because the reflexes do not exist. Even artificial inflation of the lungs is secondary to the imperative need of preserving and restoring animal heat. If the cord still pulsates and artificial heat can be supplied, it is better not to cut the cord at once. But the difficulty of maintaining animal heat under such conditions will usually determine in favor of cutting. Where Ela has reason to expect an asphyxiated child, he has a pail of water at 100° to 105° at hand, and after a single compression and relaxation to inflate the lungs, if possible, if shock is present, he immerses the body to the neck at once. One folding of the pelvis on the thorax, the body supported head downward, can be practised even before the cord is cut. The position favors drainage of the fluid from the air passages, and a moment is saved as compared with the Schultze method. A form of artificial respiration can be practised in the warm bath by alternately raising and lowering the thorax by one hand under the shoulders, the head and feet of the child being allowed to hang free, or direct inflation can be tried. If the heart continues beating, it should be left alone. If it stops, the fingers of the left hand can reach it through the flaccid abdominal wall and compress it gently against the thoracic wall. It can sometimes be aroused again.

In a favorable case the slow pulse will quicken, the child will gasp spontaneously, and the skin assume the livid color of "blue asphyxia." These symptoms are warnings to let well alone. Artificial respiration should be tried at considerable intervals. The feeble circulation cannot absorb much oxygen. An untimely compression of the thorax may abort a spontaneous gasp. Gentleness of manipulation and patience are supremely necessary. The attendant should have the nerve to wait long minutes between gasps if the pulse holds its gain in rapidity and strength. But it is well to lift the child from the bath at regular intervals and hold it head down while a movement of artificial respiration is practised. In a case which seems to become a failure, any rational means is justifiable. Alcohol, strychnine, or atropine under the skin, or a teacupful of hot salt solution passed into the rectum, may be tried. But when failure comes it is usually so rapid that there is no time for them to do their work. When the infant has reached the point of gasping spontaneously at fairly regular intervals, and the skin is blue and the musculature again has tone, a quick dip into cold water will usually establish respiration with a spectacular convulsive gasp.

A case of successful treatment of asphyxia is reported by Volland,¹ in which the practitioner was without assistance. Without cutting the cord he partially lifted the child and gently set it down, repeating this rhythmically, at the same time making pressure with the thumbs.

Septic Infection of the Newborn. Hamill² discusses the localized infections of the umbilical stump and that large group of cases ordinarily described as infections of the newborn. He comments unfavorably upon the attempts to classify these infections on the basis of their symptomatology, and states that true *melenae neonatorum* is almost invariably the result of some form of infection. He does not deny the possibility of certain other factors, syphilis especially, acting in a predisposing capacity. In the light of Lequex's investigations, it would seem that the failure to find the infecting organism in these cases has been dependent upon incomplete bacterial investigation.

Morse³ is undoubtedly right in his statement that sepsis is the most common cause of fever in the newborn. It is also a prominent cause of jaundice, cyanosis, hemorrhages, hemorrhagic diseases, certain disturbances of digestion, and of bronchitis and bronchopneumonia in the newborn. The germs may gain entrance during labor; more often, however, after birth. They are probably introduced when the mouth is cleaned with a dirty finger. Another common method of infection is during the bath, sufficient care not being taken to keep dirty water from getting into the mouth and nose. It is doubtful if they gain entrance through the navel as often as is commonly supposed, because nowadays the

¹ Corresp. Blatt. f. Schweizer Aerzte, August 15, 1909.

² Archives of Pediatrics, April 9, 1909.

³ Boston Medical and Surgical Journal, January 28, 1909.

navel is well taken care of while other portals and entrances are left open. The most important method of treatment is the preventive, and this consists in absolute cleanliness and attention to details. Auto-intoxication from the absorption of toxic substances from the intestines as the result of an infection of the normal meconium at or soon after birth is not very uncommon. Fever, rigidity, convulsions, and marked circulatory disturbances may be the result of this toxic absorption. In some cases cerebral hemorrhage has been strongly suggested. The symptoms are entirely relieved by cleaning out the intestine, best with castor oil.

Icterus in the Newborn. Many physicians take it for granted that jaundice in the newborn is always a symptom of the ordinary icterus neonatorum, and to forget that it may be due to other causes. Morse¹ holds that the most common cause of jaundice in the early days of life, outside of icterus neonatorum, is sepsis of some sort. Jaundice due to sepsis ought not to be mistaken for icterus neonatorum, however, because of the elevated temperature, the impairment of the general condition, the presence of hemorrhages, cyanosis, etc. A rare cause of jaundice in the newborn is a catarrhal condition of the large bile ducts. In such cases the movements are clay-colored, the urine contains bile, and there is, as a rule, vomiting. In this condition the movements may at first consist of meconium or be clay-colored. If they are at first composed of meconium, they become clay-colored after a few days, the urine contains bile, and the liver and spleen are enlarged.

Icterus neonatorum is almost a physiological condition. Nevertheless, it is a very common practice to give calomel, presumably with the object of increasing the secretion of bile. It is not rational to give calomel for this purpose, however, as it has been conclusively proved that calomel does not increase the secretion of bile. There is, moreover, no reason to wish to increase the secretion of bile in this condition. The most reasonable explanation of icterus neonatorum is as follows: The bile capillaries are at birth filled with bile which is more tenacious than later. The expulsion of this bile requires more mechanical work than is needed later—that is, a higher secretive pressure. There is also an increased secretion of bile immediately after birth as the result of the hyperemia of the liver. The liver cells of the newborn are able to produce a large amount of bile, but they are not able to develop the necessary secretion pressure to push the more tenacious bile quickly enough through the overfilled bile capillaries. As the result of this peculiar condition, the bile passes from the liver cells into the lymph or bloodvessels. The clinical manifestation of this passage is icterus neonatorum. It is evident, therefore, that anything which tends to increase this secretion will make the condition worse, and it is a bad, or, at any rate, a useless, practice to give calomel.

¹ Boston Medical and Surgical Journal, January 28, 1909.

A somewhat novel theory of the pathogenesis of icterus neonatorum is proposed by Hasse,¹ who has made extensive postmortem examinations. He believes the condition to be due to stasis in the bile ducts which results from action of the diaphragm during respiration. As the diaphragm descends during the act of inspiration, pressure in the bile duct and portal vein, which is already considerable, is markedly increased. Escape of bile through the ducts is interfered with and absorption occurs, with resulting jaundice. The high pressure rapidly disappears as the physiological diminution in the size of the liver occurs. There is also a readjustment in the relation of the lobes of the liver and the duodenum, which allows the escape of the bile into the intestine. A case of jaundice persisting for four months is reported by Herrman.² The patient was otherwise normal and the family history good. The birth was normal and the patient was breast fed. The stools were white in color and the conjunctiva and skin were markedly jaundiced. It was certain that the case was not one of persisting icterus neonatorum, and there was no evidence of sepsis. In fact, all other conditions could be eliminated, and the case was probably one of simple catarrhal jaundice. This condition, however, is extremely rare in infants.

Tuley³ points out that, owing to the frequency of septic invasion through the navel and its conveyance to the liver through the ductus venosus and the portal vessels, a septic process is set up in the gall-bladder and ducts, with absorption of bile. Its prevention is of the greatest importance by proper care of the umbilical stump and excluding possible infection. An unusual case of *fatty infiltration of the liver* in an infant, aged three months, is reported by Pratt.⁴ The abdomen was greatly distended and the digestion was much impaired. Upon autopsy the liver was found to fill a large part of the abdomen. The child was artificially fed, but the etiology of the unusual condition was not explained.

Hemorrhages in Infants. Hemorrhage in newborn infants cannot be regarded as a rare condition. Its etiology has not been clearly demonstrated, but it is now commonly believed to be due to septic infection. It is usually accompanied by fever. Tuley⁵ considers some of the supposed causes, and reports a case in which prompt recovery followed the subcutaneous injection of gelatin. Thorough sterilization of gelatin used for such purpose should be secured on account of its not uncommon contamination with the tetanus bacillus.

Schwartz and Ottenberg⁶ report an unusual case of hemorrhage in which blood transfusion was performed in a newborn child. The baby

¹ Jahrbuch f. Kinderheilkunde, June 12, 1909.

² Archives of Pediatrics, September 9, 1909.

³ Ibid., August, 1909.

⁴ Boston Medical and Surgical Journal, September 16, 1909.

⁵ Journal of the American Medical Association, December 26, 1908.

⁶ Medical Record, February 20, 1909.

was perfectly healthy until the seventh day, when he began to vomit after feeding. On the eighth day the vomitus contained blood, and blood was noticed in the stools. On the tenth and the eleventh days bleeding occurred from the mouth. There was no skin eruption, and the liver and spleen were palpable. The lymphatic glands were not enlarged; 10 c.c. of horse's serum was injected subcutaneously, but failed to have any effect upon the bleeding. It was learned that the baby's blood coagulated in forty-eight minutes, and the father's blood in from four to five minutes. If a portion of the father's blood were added to a portion of the baby's blood the coagulation time was reduced to the normal. The addition of the calcium salts had no effect upon the coagulation, and so transfusion was decided upon. At the time operation was decided upon the hemoglobin was 40 per cent., and when the child was placed upon the operating table it was reduced to 30 per cent. The father furnished the blood for the transfusion. At operation the child appeared to be dead. During the operation the hemoglobin increased from 30 to 90 per cent. in the course of twelve minutes. When the latter percentage was reached the transfusion was stopped. As soon as the child got the father's blood the bleeding ceased and the coagulation time was practically normal. For five days after the operation the bleeding ceased, but then began again. The child died on the twenty-first day as the result of loss of blood.

An unusual case is reported by Guerin-Valmale.¹ The first symptom was a hemorrhagic eruption occurring on the third day. There was free hemorrhage from the digestive tract, the symptoms continuing for about a week. Chloride of calcium was administered for a week and adrenalin was given by lavage. The author believed that he could exclude septic infection and all causes except hereditary tendency to hemophilia. The course of the disease, however, of one week, terminating in complete recovery, makes it difficult to exclude the idea of infection.

Premature Infants. The importance of care and attention to minute details in the treatment of weak and premature infants is referred to by Morse.² In their anxiety to look after the mother, physicians are likely to forget the baby during the first hour or two after birth. It is hastily wrapped up in something, put in a corner or in a chair, and left to shift for itself. The result is that the baby is chilled and almost irreparable harm is done. It is especially important to prevent chilling at birth and in the succeeding hours, as the baby's vitality at this time is especially low. The premature baby should not be bathed or dressed, and should be started immediately under the proper conditions. When labor is induced, everything should be prepared beforehand; the padded crib with heaters, the gown, etc., should be all ready, so that the proper

¹ Bulletin de la soc. d'obst. de Paris, 1909, vol. xii.

² Boston Medical and Surgical Journal, January 28, 1909.

care can be begun at once. There is a tendency to give premature infants too strong foods and to give them in too large amounts. It is even more important with premature than normal infants to begin with small amounts of food and very weak mixtures, increasing the strengths and the amounts as necessary. Breast milk is even more important for the premature than for the full-term infant, as its digestive powers are imperfectly developed. Physicians are apt to leave too much to the discretion of the nurse. Too much handling, a bath, a mere chilling, or one improper feeding may mean the difference between a successful and an unsuccessful outcome.

Maygrier¹ draws particular attention to three dangers to be combated in the management of premature infants, viz., chilling, imperfect feeding, and septic infection. If the child can be fed with breast milk, even if drawn from the breast and fed with the medicine dropper or spoon, it is liable to thrive, if infections can be guarded against. Such children are especially susceptible to septic infection, and constant caution is necessary.

The Urine in Diseases of Infancy. A study of the urine in 667 cases is reported by Morse and Crothers.² Putting aside diseases of the gastrointestinal tract, albuminuria and casts are more often found in pneumonia and meningitis than in any other of the acute diseases of infancy. It does not corroborate the statement of Cassel and Simmonds as to the importance of otitis media in the etiology of nephritis in infancy, nor those of many Italian and French authors as to the frequency of renal complications in eczema. It shows that the kidneys are not, as a rule, affected in diseases of nutrition, although in scurvy and severe anemia the urine may show the evidences of the hemorrhagic characteristics of these diseases. It also shows that affections of the kidneys secondary to other diseases in infancy do not usually produce edema, and, conversely, that edema in infancy is usually due to some other cause than disease of the kidneys. The study of these cases seems to justify the conclusions that the presence of albumin and casts in the urine in the acute diseases of infancy is the manifestation of an unusual degree of toxemia, and is, to a slight extent, of bad prognostic import. This conclusion is justified only in a very general way, however, as many infants showing albuminuria and casts recovered, and many others in which the urine was normal did not. There was nothing in these cases to show that the renal condition had any influence on the outcome. It was merely an index of the toxemia. So few pathological examinations were made that no statement is justified as to the pathological changes in the kidneys. It seems fair to assume from the changes in the urine, however, that in the vast majority of cases the pathological condition did not go beyond

¹ Presse Médicale, December 19, 1909.

² New York Medical Journal, March 13, 1909.

an acute degenerative nephritis, and that a definite parenchymatous or interstitial nephritis was very uncommon. It seems evident, from a study of these cases, that febrile albuminuria and acute degenerative nephritis occur in the same conditions, and at least as frequently in infancy as in childhood and adult life.

The same authors¹ report a study of the urine in 300 cases of *gastro-intestinal disease*, from which they conclude that albuminuria is found in from 8 to 10 per cent. of babies ill with various diseases of the gastro-enteric tract. It is found somewhat more often in the acute than in the chronic diseases. Judging from the examination of the sediment, the pathological condition in the kidneys almost never progresses beyond that of acute degenerative nephritis (often known as cloudy swelling or active hyperemia). Infection of the urinary tract resulting from the symptom complex commonly known as pyelitis, or pyelonephritis, is far more common than acute parenchymatous or interstitial nephritis. In the chronic diseases there is no relation between the albuminuria and the mortality or symptomatology. The mortality is higher in the acute diseases when albuminuria is present than when it is not. The presence of albuminuria in an individual case does not, however, materially modify the progress in that case. Edema occurring in the course of diseases of the gastro-enteric tract is not connected with the condition of the kidneys. There is nothing to suggest any causative relation between the affection of the kidneys and such symptoms as restlessness, convulsions, and stupor. These are due to toxemia and not to uremia.

Lippe,² of St. Louis, calls attention to the frequency of urinary infection in infancy and childhood, and draws attention to the importance of making a urinary examination in every acute febrile disturbance not clearly accounted for. The urine is more frequently infected than is commonly believed by practitioners. Morse³ contributes an extended and scientific article on infection of the urinary tract by the *Bacillus coli* in infancy. Kerley⁴ presents three temperature charts of cases of *acute pyelitis in infancy*, and calls attention to the frequency of overlooked urinary and kidney infections. Moll⁵ demonstrates that phosphoric acid is not found to any marked extent in the urine of healthy infants. He asserts that the appearance of phosphates is an early and reliable sign of illness, and may appear before other signs are present.

Enuresis. Leonard Williams⁶ reports the use of *thyroid extract* for enuresis, with most satisfying results. To a boy, aged nine years, he administered one-half grain twice daily. Immediate and complete result followed. Adenoids had been removed from the throat of the

¹ Archives of Pediatrics, August, 1909.

² Ibid., January 9, 1909.

³ American Journal of the Medical Sciences, September, 1909.

⁴ Archives of Pediatrics, March, 1909.

⁵ Jahrbuch f. Kinderheilkunde, February, 1909.

⁶ Lancet, May 1, 1909.

boy, which were supposed to be the cause of the enuresis. The boy, however, was worse after the operation, and Williams reasoned that he had been deprived of some internal secretion. The thyroid was, therefore, given on that theory. The result was so good that twenty-four other cases were treated in a similar manner, with but one failure. The author concludes from his experience that adenoids are not a cause of enuresis.

Status Lymphaticus. The subject of sudden death in children and the status lymphaticus was considered in extenso in these pages two years ago.¹ The question still, however, seems to be far from settled. Howland,² who has made a particular study of the condition, says that the consideration of thymic hypertrophy is rendered difficult by the lack of a normal standard. In the first two years of life this is variously given as anywhere between 5 grams and 30 grams; 15 grams probably represent the average weight throughout the first two years of life, and yet it seems probable that glands weighing considerably more than this are not very unusual, and that the pathological complex known as status lymphaticus is much more common than is usually supposed. Richter believes it to be perhaps the regular finding. The majority of authors do not subscribe to this view, and there is general unanimity in the acceptance of Paltauf's views in regard to status lymphaticus as a pathogenic entity. He laid stress only upon the type of individual dying suddenly. Strehla's experiments upon hyperthymization of the blood lacked confirmation. Recent experiments show that the glands normally or pathologically enlarged are no more toxic than other animal tissues. It has been suggested that the thymus hypertrophies to compensate for the lymphatic glands which are frequently found to have degenerated. Recent studies of normal thymus glands by Stoehr and Hammer indicate that the thymus is not composed of lymphoid tissue. If this is so, such an hypothesis seems altogether improbable. At the end of twenty years after Paltauf's original paper a satisfactory explanation of the cause of death is entirely lacking.

The most notable article of the year is probably that of Warthin, of the University of Michigan,³ whose conclusions are as follows: (1) The status lymphaticus or the condition of thymic hyperplasia, has no specific pathological entity. It is a collective pathological complex. (2) Hyperplasia of the thymus, aside from leukemic, lymphocytomatous, tuberculous, and other enlargements, is an expression of a hypoplastic constitution associated with or dependent upon a chronic lymphotoxemia or a congenital hypoplasia of the lymphoid tissues, or an altered function or disturbed development of the thyroid, adrenals, sexual glands, or osseous system occurring during the period of development. (3) The hyperplasia of the thymus is compensatory in nature. It constitutes

¹ PROGRESSIVE MEDICINE, March, 1908.

² Archives of Pediatrics, April, 1909.

³ Ibid., August, 1909.

the most important feature of the conditions grouped under the complex of status lymphaticus. (4) In young children the hyperplasia of the thymus is the most prominent feature. At puberty and after, the constitutional hypoplasia that has been styled the status lymphaticus becomes more prominent. The two conditions are essentially the same, and borderland cases of all stages and degrees occur. (5) In young children and more rarely in adults the hyperplastic thymus may cause a mechanical death from pressure, chiefly upon the trachea, but also upon great vessels and nerves. This is probably the most frequent cause of so-called thymus death in infants and children. In adults, cardiac death is the rule, as a result most probably of disturbed correlation of thymus, thyroid, and adrenal function. The occurrence, however, of thymic stridor, thymic tracheostenosis, and mechanical thymic death has been demonstrated. (6) The underlying lymphotoxemia and general hyperplasia create an especial susceptibility and lowered resistance to infections. (7) The true nature of thymus hyperplasia will be revealed only when the function of the thymus and its correlations are made known to us.

In discussing this paper, Holt¹ did not agree that the sudden death is usually due to pressure. Children suffering from status lymphaticus certainly have very feeble resistance and show great susceptibility to many adverse conditions. In them the slightest thing, a small wound like the prick of a needle, anesthesia, acute indigestion, as well as the beginning of an acute illness, seem sufficient to disturb the delicate balance and precipitate a fatal attack. He thinks that the great prostration, the extreme restlessness, cyanosis, and convulsions point to a toxic condition rather than to mechanical obstruction. Blake² advises against the performance of minor operations and operations not strictly necessary upon patients showing evidence of this condition. He expresses doubt as to the most suitable anesthetic, and has seen three deaths during narcosis, although it is the accepted belief that they are more common after chloroform. On the whole, however, he prefers ether to chloroform.

Ewing³ asserts that status lymphaticus has now become a well-recognized condition of great clinical significance in relation to sudden death. It is frequent enough to be kept constantly in mind, being found in from 1 to 3 per cent. of autopsies. It has been found by Ohlmacher in many cases of epilepsy. Hannseman has emphasized its importance in Graves' disease, and Ewing has observed it in four or five fatal cases. It figures in most fatalities from short submersion in water, and is the chief underlying condition in fatalities under narcosis. Elser has recently shown that it is present in most cases of fulminant meningitis, an observation verified by Norris, so that it must stand as an important predisposing

¹ Archives of Pediatrics, August, 1909.

² Ibid.

³ Ibid.

cause of fatal meningitis. Northrup¹ expresses doubt as to the pressure theory of death, and calls attention to the fact that a child can breathe readily through the small caliber of an intubation tube, something supposed impossible before demonstration.

Meltzer² doubts that the sudden deaths in status lymphaticus are respiratory deaths. The phenomena of acute asphyxia are so characteristic that nobody can be in doubt as to the nature of the cause of that death; even the layman present would state simply that "the child suffocated." All the descriptions indicate that we deal in these cases of death in status lymphaticus with sudden cardiac failure. This, however, could be caused by the sudden increase in size of the enlarged thymus. It is a well-known fact that pressure upon the pneumogastric nerves causes stoppage of the heart. A normal heart can be arrested many times without serious consequences. It is different, however, with hearts which have lost their stability from one cause or another. Meltzer asserts from experimental experience that under certain conditions a single slight stimulus applied directly to the vagus will cause suddenly a fatal stoppage of the heart. We might, therefore, assume with reason that in the cases in which the stability of the heart is undermined either by chronic respiratory insufficiency, chloroform, diphtheria, or by any other infection or intoxication, a sudden enlargement of the thymus might occasionally be capable of exerting upon both vagi within the thoracic aperture a pressure sufficiently strong to bring about a standstill of the heart which would prove fatal. From this point of view we might also accept the theory of Warthin, that in cases of status lymphaticus a good deal of lymphoid material is being absorbed into the system.

J. P. C. Griffith,³ in an excellent article, classifies the several theories which have been advanced as follows: (1) *Non-mechanical or convulsive*. (a) A hyperthymization of the blood, the result of overproduction of thymic secretion; (b) defective secretion of the thymus, with consequent constitutional disturbances; (c) a toxic action of some other nature, not definitely known; (d) a neurosis of some sort through which the nervous system is extremely sensitive, and cardiac inhibition follows from slight and often undiscoverable causes—thymic enlargement and other lesions of the status lymphaticus are its anatomical manifestations; (e) a neurosis of this nature, independent of any so-called status lymphaticus. (2) *Mechanical*. (f) Pressure upon the trachea, producing reflex inhibition of the heart's action through irritation of tracheal nerve filaments; (g) pressure upon cardiac nerve trunks or the great vessels; (h) direct compression of the trachea, with consequent strangulation.

As to the method by which the thymus exerts pressure, under the head-

¹ Archives of Pediatrics, August, 1909.

² Ibid.

³ New York Medical Journal, September 4, 1909.

ing "mechanical," there are various opinions, viz., the pressure may be produced (a) by swelling due to retention of its own secretion; (b) by edema; (c) by congestion; (d) by bending back of the head and consequent sudden narrowing of the space occupied by the trachea and the enlarged thymus; (e) by sudden shifting of the position of an already enlarged thymus into the "critical space" of Grawitz, and consequent pressure on the trachea. Only two views have received acceptance at all universally: (1) That there is a neurosis of some sort, toxic or otherwise, and that death is a cardiac death. (2) That there is compression of the trachea, and that death is due to strangulation.

Griffith is convinced that whereas there are cases in which death results from pressure of the thymus gland upon the trachea, they are exceptional, and warning in such cases is given by symptoms of strangulation, gradually increasing in severity. The cases of actually sudden, or at least rapid, death, he thinks, depend upon a neurosis which may be associated with lymphatic and thymic enlargement as its anatomical manifestation, but is not necessarily so. It is only on the supposition of some such neurosis as a result of which cardiac inhibition takes place from insignificant causes, that a reasonable explanation is to be found for the sudden deaths which have been under discussion. An extended article by Bruce¹ discusses particularly status lymphaticus as a cause of death under anesthesia, and concludes that ether should be chosen in preference to chloroform, even for the youngest babies.

Rachitis. Kassowitz,² who has so long been a student of this condition, again asserts his view that rachitis is not a constitutional disease, but a chronic inflammatory disorder of growing bones. It has been his observation that most children who present the typical rachitic symptoms are not anemic, and are commonly in good health. He holds, therefore, that the condition is not due to a disturbance in metabolism. The rapid growth shown by some rachitic children, according to Kassowitz, may be a factor in producing the rachitic changes in the bones. It is well-known that rachitis is most common during the spring months, and diminishes in frequency during the hot summer months. This would seem to show that it is not due to acute gastro-intestinal disorders. The head sweating and restlessness at night occur only after the rachitic changes in the cranial bones have taken place. Extension of the inflammatory process from the bones and cartilages to the capsules of the joints would seem to be the cause of the tenderness so common in these children. The chief causes of rachitis, according to Kassowitz, are a predisposition, usually congenital, and exposure to impure air.

The relation of rachitis to the suprarenal capsules is studied by Jovane and Pace,³ who conclude that there is no relationship between

¹ Canada Lancet, July, 1909.

² Jahrbuch f. Kinderheilkunde, March, 1909.

³ La Pediatria, March, 1909; Archives of Pediatrics, July, 1909.

the two. Sittler¹ believes that rachitis is due to the feeding of children on excessive amounts of carbohydrates, particularly flour. He asserts that in its early stages it can be cured by eliminating flour from the diet. It is worthy of mention that flour is but little used in this country in the diet of children.

Hutinel² reports a series of observations made on the bones and cartilages and bone marrow. From these studies he concludes that the physical manifestations of rachitis are due to dystrophy, which affects the tissues of lesser resistance. During the first months of life all the tissues suffer when the assimilation is imperfect. As the child develops, the resistance of some tissues increases more rapidly than does that of others, and in rachitis the bones take the brunt of the attack. Schabad³ asserts that rachitis is due to deficiency of lime. This may result either from an insufficient intake or from imperfect absorption. He believes that breast milk should be examined as to its lime content as well as for other elements. He would make a distinction between true rachitis marked by an increased elimination of lime and phosphorus, the phosphorus elimination predominating, and pseudorachitis due to lime starvation, in which the elimination of the lime predominates. The statement was recently made in New York that rachitis is due to lack of sunlight and air, and is not a dietetic disease. It is clear from these divergent views that the pathology and causation of rachitis is not yet determined.

Functional Neuroses in Children. That neuroses of every description are on the increase in all civilized countries is well known to medical men. It is a sign of the times and a necessary corollary to the manner in which we live. Infants born and brought up in towns and those whose parents are of unbalanced and unstable nervous temperament can hardly fail to suffer from neuroses. It is a penalty of so-called advanced civilization. In endeavoring to cope with such affections the main object is to strike at the root of the evil and to attempt to better the conditions under which the majority of the dwellers in towns live. Treatment is essential, but prevention must be the chief aim.

These neuroses are the subject of an editorial article⁴ based on a recent paper of Coutts, of London. Several of them begin in earliest infancy. For instance, cases of faulty deglutition, where an infant rolls and gargles each mouthful of milk at the back of the pharynx for some time before finally swallowing it. Sometimes such cases improve with the thickening of the food at the appropriate age, but in other instances the difficulty commences with the thickening of the food. Defective respiration is a much rarer neurosis of infancy, and at the

¹ Fortschritte der Medizin, Leipsic, July 20, 1909.

² Annales de Médecine et Chirurgie Infantiles, August 15, 1909.

³ Berliner klinische Wochenschrift, May 3, 1909.

⁴ Medical Record, October 23, 1909.

same time far more dangerous. Both faulty deglutition and defective respiration are to be ascribed to defective training of the nerve centres concerned with deglutition and respiration respectively. As to the pathology of pyloric stenosis, Coutts, himself, considers it unsettled; but as most authors consider that it arises solely from spasm, he feels justified in including it among the functional neuroses. Some authorities advise operation, while Hutchinson and others hold the view that in no circumstances should operation be performed. In regard to the neuroses of later childhood, Coutts is of the opinion that cyclic vomiting is merely a phase of migraine. Family histories and sequels confirm the identity of the two complaints, although typical migraine, as witnessed in adults, is rare in children before the age of puberty. The form it takes in young children is that of recurrent attacks of pyrexia and drowsiness, together with a certain amount of headache and vomiting, and is usually looked upon as simply an attack of biliousness.

Infant Foods. The literature upon infant foods and the production of milk has been unusually meagre during the past year. Two years ago¹ it was stated that there had been extraordinary activity in the campaign for securing better milk. Although the literature upon the subject has recently been scant, it is not to be concluded that practical efforts have been remitted. At the annual meeting of the American Association of Medical Milk Commissions, held in June, 1909, fifty milk commissions were reported as being actively at work in the United States and Canada. These commissions are doing a most commendable work, and at the least seven were organized during the first half of 1909. The address of the President, Dr. R. G. Freeman,² was an admirable review of the development of dairy hygiene. An extended review of recent work will be found in these pages, as already referred to. Rotch³ calls attention to the dangers of cheap milk, and describes some of the efforts that have been made in this country to perfect the milk supply. He asserts that we have the best milk farms in the world and the best research laboratories for milk. Young American men have come to the front and are not kept down by traditions.

The pasteurizing of milk is strongly advocated by Amyot,⁴ of Toronto, as he believes there is no positive chemical or physical evidence to show that it alters the milk. The cream line is not altered, and it is doubtful if the nutritive value of the milk is impaired. The process renders the milk safe from bacterial contamination. Fortesque-Brickdale⁵ asserts that the higher heating checks the inhibitory power of fresh milk on bacterial growth. He asserts that clinical opinion in Europe is coming

¹ PROGRESSIVE MEDICINE, March, 1908, p. 203.

² Archives of Pediatrics, October, 1909.

³ Journal of the American Medical Association, June 19, 1909.

⁴ Dominion Medical Journal, August, 1909.

⁵ British Journal of Children's Diseases, March, 1909.

to the view that clean milk is better for infants than heated milk. He asserts also that heat produces certain alterations in the physiological character of the milk, which he divides into three groups, as follows: (1) Obvious changes in taste and color due to the action of the heat on lactose and the formation of a "skin" from the drying of proteid on the surface—these are of little importance. (2) The precipitation of calcium and changes in organic phosphorus compounds. Heated milk is less acted upon by pepsin and trypsin, and is probably less easily absorbed. The physiological effect of changes in phosphorus is not well known, but since it is needful to the human infant, and cow's milk is poor in organic phosphorus, the decomposition of these compounds may be considered a detriment. (3) Changes concerning the vital properties of milk. These are the least easily detected of all. Enzymes, agglutinins, and precipitins are destroyed and phagocytosis by the milk cells is abolished.

While these changes may all take place in sterilized or boiled milk, it is proper to add that Freeman asserts most positively that none of them occur in pasteurized milk, as that term is now generally understood in this country.

Van Slyke and Bosworth,¹ of the chemical laboratory of the New York Agricultural Experiment Station at Geneva, describes a simple and accurate method for the determination of casein in cow's milk, but space forbids a reproduction of the details. In the modification of cow's milk for infant feeding, it is highly desirable that the percentage of casein be known, if the work is to be done with precision. Methods thus far have been rather complicated. The authors, whose standing as physiological chemists is well known, assert that the method presented is quick, accurate, and practicable in the hands of physicians.

Breast Feeding. The fact is pointed out by Stowell² that the modern mother is not the first to need admonition regarding the importance of breast feeding. He quotes the words of Dr. Harris, physician to William and Mary in the early part of the eighteenth century, who wrote as follows: "It is grievously to be lamented that so many mothers, not only of high rank, but even of the common sort, can with so much inhumanity and more brutish cruelty desert their tender offspring and expose them to so many dangers of mercenary nurses, who are greedy only of the profuse rewards bestowed on them at christening, and so being weary of their present employment perform it negligently while they are looking out for a new prey. Let us make a survey of the advantages that permit mothers so commonly to sacrifice their beloved offspring. They are the more free enjoyment of diversions, the greater niceness of adorning their persons, the opportunity of receiving imperti-

¹ New York Medical Journal, September 18, 1909.

² Medical Record, May 22, 1909.

nent visits and returning those insipid favors, the more frequent attendance on the theatre, or the spending of the greater part of the night at their beloved cards.”

In an admirable article urging the physician to help the mother nurse her child, Ostheimer,¹ of Philadelphia, enters a plea not to begin artificial feeding without first trying to help the mother to maintain her milk supply. He refers to Griffith's statement that the possibility of improving the quality or quantity of breast milk must never be forgotten before weaning is advised. An alteration in the diet, in the quantity of liquids taken, and in the amount of exercise employed will often attain the desired result. As to the details to be observed, he refers to statements of Morse, who says that a nursing woman ought to lead her usual life and not be treated as an invalid. She should take her usual food, but more of it. She must have light and air, and must not be shut up in the house. The best method of increasing the quantity of breast milk is the use of the breasts. Within reasonable limits, the more taken the more there is produced. Other methods are entirely subordinate. Among them may be mentioned (1) improvement of the general condition, and (2) a liberal diet.

This article of Ostheimer's is the subject of an excellent editorial article,² in which it is asserted that it is no recent discovery that no milk, however ingeniously “modified,” can ever entirely replace in all essentials normal milk from the breasts of a healthy mother. Even before a scientific study of the composition of cow's milk, with a view to its adaptation for infants, was well undertaken, no less a person than Oliver Wendell Holmes declared that “a pair of substantial mammary glands were worth far more than the most learned dissertation from the shrivelled forefinger of the most learned professor.” Too often, at the urgent request of the mother or some other member of the family, the physician is induced to “dry up” what little milk the breasts are endeavoring to secrete and begin the discouraging task of working with top milk, boiled water, milk sugar, lime water, cereals, etc., prescribing the percentage of this or that which he thinks may start the baby properly on its fight for life. Too often the physician has found a less scientific and more practical attendant succeeding him, and working wonders, by calling in the right kind of a wet-nurse when the marasmic baby seemed to be swiftly and surely sliding away from life. Even though the mother dislikes the task, persuasion, encouragement, good advice, and perseverance have taught her at least to tolerate it, and have made her heart glad through the splendid health which her offspring has thus secured. As in many other matters of medical management, preparation and prevention are watchwords to success.

¹ Journal of the American Medical Association, August 14, 1909.

² Medical Record, September 11, 1909.

Sharp criticism of the obstetricians upon their management of the infant is made by Morse,¹ who has been forced to believe that, as a rule, they do not thoroughly appreciate the importance of breast feeding and its advantages over artificial feeding. This is the more surprising because, as a class, they are not too familiar with the finer details of artificial feeding. There are obstetricians who tell their patients that artificial feeding is better than breast feeding, and that consequently women, or, at any rate, those of the wealthier classes, should not nurse their babies. This position is absolutely wrong, and such advice is not only erroneous, but almost criminal. There are several reasons why obstetricians are so willing to give up or not to insist on breast feeding. They apparently do not appreciate the difference between human and cow's milk. These differences are more than gross chemical composition. The albumins are chemically different, and it is probable that the fats, and possibly the sugars, are also different. At any rate, the albumins of cow's milk are heterogenous and not homologous for the human infant. There is much difference in the salts of the two milks. No one knows of how much importance the salts are in metabolism, but they probably play a far more important part than we realize. All milks contain enzymes. The enzymes of cow's milk are not the same as those of human milk. They also probably play a more or less important part in the metabolic processes. Human milk also contains immunizing bodies which are not present in cow's milk—that is, cow's milk is not human milk and can never be made so, however much it is modified.

They do not appreciate how much even a little breast milk aids in the digestion of cow's milk, and how much better a baby thrives if it has breast milk in addition to cow's milk, even if it gets only one or two feedings a day. Neither do they appreciate how much better able a baby is to digest cow's milk if it has had breast milk for a few months or even weeks before it is compelled to take cow's milk. They are inclined to think entirely of the mother's well-being and to forget the baby. They are too willing to yield to the desire of certain unnatural mothers to shirk their responsibilities in order to continue their amusements and social duties. They are apt, too, to forget how late the milk may be in appearing, and to give up the attempt at breast feeding too soon. They apparently fail to appreciate how much may be done to improve the quality and quantity of breast milk. The attempt should always be made to feed the child at the breast. Almost the only contraindications are tuberculosis or some other serious disease in the mother. The attempt at breast feeding should not be given up unless continued trial shows that the milk cannot be improved.

Much has been written in recent years upon the germicidal power of

¹ Boston Medical and Surgical Journal, January 28, 1909.

breast milk. It has until recently been the custom to consider only the nutritional value of milk and other forms of food. Since the discovery of the immunizing power of breast milk, another reason for its value as a food has been added to the many already recognized. Among numerous investigators, Sajous¹ is convinced of this power of milk. He believes that the protection of the breast-fed infant depends in no small degree upon bactericidal and antitoxic substances physiologically supplied to it in the maternal milk. All phases of the problem indicate that, of the various modes of feeding, direct maternal nursing affords the greatest protection to the infant.

Artificial Feeding. The assertion has recently been made by Dr. Rotch² that there has been but little real progress in infant feeding during the last four or five years. We never have accomplished in so-called artificial feeding what has been done by nature's process of feeding from the human breast, though there is no question that in many cases human breast milk is very bad for young infants. The baby has been fed on routine mixtures, as a rule, with little scientific knowledge, less real practical knowledge, and almost with ignorance, to a greater extent than occurs in any other branch of the medical profession. There is no one rule for feeding babies.

This statement is in accord with my assertion made in these pages last year that, notwithstanding the large number of articles which appear on the subject, but little new and really valuable knowledge has recently been added to the subject of artificial infant feeding.

There is unquestionably a tendency to adopt artificial feeding too quickly and without proper attempts to keep the infant on the breast. Southworth³ very properly asserts that philanthropists who are interested in the distribution of ready prepared modified milk to the poor of our large cities should seriously consider whether they are achieving the greatest good in the best possible manner. Not only are the formulas distributed so few in number and so inelastic as to be unsuited to a certain proportion of the infants, but the system contributes very little to the education of the lower classes in the proper methods of infant feeding. While a commendable stop-gap for infant mortality, these doles of already prepared milk approach dangerously near the futile *panem et circenses* of the Roman empire, which only hastened its dissolution. Far more productive in its results, and of ultimately greater hopefulness for the offspring of the poor, is the work which is progressing in certain of our outdoor dispensaries for children, for these teach the mothers right principles of infant feeding, and through instruction in home preparation and care of the food are slowly but surely overcoming ignorance and tradition, and spreading a leaven which, passed along

¹ University Medical Bulletin, June, 1909.

² Journal of the American Medical Association, June 19, 1909.

³ Ibid., July 3, 1909.

from neighbor to neighbor, cannot fail to produce important results in more intelligent feeding of infants among the masses.

The relation between the science and art of infant feeding is discussed by Chapin,¹ who has done so much to rescue the subject from the chemical bog in which it was floundering. He again calls attention to the fact that a chemical analysis of milk will show the ingredients and, to a certain extent, its food values from their quantitative amount. There is something beyond this, however, that chemistry cannot explain. While the fats and carbohydrates in their composition and reaction to the digestive secretions are a good deal alike in different milks, the proteins are essentially different. Chemistry alone cannot explain this phenomenon. We must study the reaction of the protein to the digestive secretions, and then examine such reactions in relation to the growth and development of the digestive tract—in other words, investigate the question biologically before we can understand the problem. A certain portion of all milks coagulates on coming in contact with rennin and acid, but the manner and extent of this coagulation stands in a direct relation to the proper evolution of the digestive tract of the animal. While there are many grades of coagulability in the milks of different animals, for practical purposes we may distinguish three of these grades and consider their significance. The protein may coagulate in a solid, a gelatinous, or a flocculent manner.

In the ruminant, herbivorous animals—such as the cow, sheep, or goat—the protein coagulates in a solid, tough mass that cannot readily leave the stomach. In these animals digestion is largely gastric, and the stomach forms 70 per cent. of the digestive tract. Later, the stomach will be called upon largely to digest tough, stringy masses of hay and straw, and the previous exercise of the tough curds of the milk develops it for its future work. In the non-ruminant herbivora—such as the mare and the ass—the protein coagulates in gelatinous masses that can easily leave the stomach. The reason for passing the curds quickly along is that in this class of animals digestion is largely intestinal, and the intestines form about 90 per cent. of the digestive tract. Later, grain and grasses must be largely digested in the intestinal portion of the tube, and hence the curd is here also especially adapted to develop the intestinal tract for its future work. In human milk the curd is thrown down in flocculent masses, a form intermediate between the solid and the gelatinous types of curd previously noted. While digestion begins in the stomach, it is largely carried on and completed in the intestine, and the stomach forms about 20 per cent. of all the digestive tract. The curd is thus adapted to start the development and motability of the stomach, and finishes by instituting those functions in the bowel which is destined to play a predominant part in digestion. Here,

¹ Journal of the American Medical Association, September 18, 1909.

again, the curd, so far as the form is concerned, furnishes an analogy to the future food of the infant. The curd forms small, flocculent masses, and the future food must be separated later into small masses by chewing before digestion can take place to the best advantage.

Biological science thus shows us that while a certain amount of protein is present in the milk of all animals, and is necessary for tissue building and growth, this protein must not only be coagulable, but must curd in a certain specific way in each species of animal. The protein is thus the least readily interchangeable of the ingredients of the milks of each species. In this way science teaches us that the protein must not be thrown into a soluble form or so altered as not to act normally in connection with the digestive secretions if we would have healthy growth. We must always remember that the protein has a developmental as well as a nutritive function to perform. While immediate nutrition is of great importance to the growing infant, we must not, by putting all food in a soluble form for quick digestion, neglect to give proper work for the secretions and musculature of the digestive tract. It is only by the latter method that the natural food for the adult can normally be digested by a normally developed tract.

The science of infant feeding will thus influence the art by showing what should and should not be done in the various manipulations that may be advised. Briefly, all the food principles must be present, and in about the same proportion as in the natural food of the infant. Chemistry will tell us this from an average of many examinations, but cannot say the final word. It can tell us that protein exists in certain amount, not the form and adaptation of the protein, for the infant's digestive tract can only be determined by biological methods. Various methods of preparing foods have been well worked out and simplified, but they will be of little value to the physician unless he knows why, and when, and how to use them. In this way only can scientific methods prevail. Infant feeding can only become scientific by being placed in line with scientific methods in general.

In discussing food intoxication in childhood, Ruhräh¹ calls attention to the fact that a large part of pediatric practice results directly or indirectly from errors in diet. While it is not possible to form a definite symptom complex for the conditions produced by errors in either of the important food elements, much can be done if the practitioner possesses certain general knowledge. Ruhräh, therefore, outlines these errors somewhat as follows: Taking of too much food of all kinds usually causes such attacks as are described by the laity as biliousness. The attacks occur with greater or less frequency, and are characterized by fever, a coated tongue, foul breath, headache, malaise, often drowsiness; there is often vomiting or diarrhea, or both, and the liver may be some-

¹ Journal of the American Medical Association, July 10, 1909.

what enlarged and tender. A brisk purge and limitation of diet usually are all that is needed.

Too much protein causes, as a rule, much the same symptoms. Sometimes some one symptom is especially prominent, as recurring headache, or recurring neuralgia, or attacks of vomiting, or, in milder cases, periods when the tongue is furred and the breath foul without much other disturbance.

Too much fat is a frequent cause of trouble, and many children are often intentionally overfed with fat. These are cases of malnutrition in which large quantities of butter, cream, cod-liver oil, and other fats are given with the idea of fattening the child and restoring its normal condition. The result is that the nutrition is not improved, but is usually made worse. The child is unwell, has a pale, muddy skin, and large black circles under its eyes; one of the most striking features is a coated tongue and an exceedingly fetid breath. There is gastric disturbance and vomiting is frequent, and there is often diarrhea, with the passage of undigested fat in the stools.

The carbohydrate cases are the commonest of all, owing to the fact that a great many children are given large quantities of starches and sugars, not only at their meals but between meals, in the shape of sweets of various kinds. Many children have a very low capacity for utilizing sugar, and some for both sugar and starches. As in the other forms, the periodicity of the attacks is one of the striking features. Perhaps the most common form of the attack is recurrent vomiting, although this may be seen in cases in which protein metabolism is at fault. In some instances the attack consists merely of fever, or a sick headache, while in other cases there are attacks of asthma which sometimes follow indiscretions in diet. The most difficult cases to manage are those in which there is a combination, an inability to utilize normal quantities of protein and carbohydrate, so it is difficult to arrange the diet satisfactorily. The results in preventing the attacks are remarkable if the coöperation of the family can be secured. Having found out the food factor at fault, an effort should be made to determine what quantity of that element can be utilized, then to keep the child on a diet well within the limits of its power of assimilation. In addition to this, it is exceedingly important to see that the bowels are regular, and a good plan is to use some fairly active purge at least once a week. Outdoor life and plenty of exercise is exceedingly important, and many patients are greatly benefited by a sojourn in the country, where an active outdoor life may be led without too much restriction in the matter of observing social forms.

Considerable attention has been given in this country during the past year to the caloric method of feeding. The subject is reviewed in an editorial article¹ of considerable interest. Since Heubner, a few years

¹ Medical Record, July 17, 1909.

ago, carried out his experiments on the energy requirements of the infant, the caloric method of feeding has been largely adopted in Germany. The method employed is to make a milk-and-water mixture which the physician believes the child can digest, calculate the energy equivalent of this in terms of heat units, and add enough milk sugar to raise the caloric content to between eighty and one hundred calories for each kilogram of body weight, the figures arrived at by Heubner as the energy requirement of the healthy infant. In this country, when the calories are calculated, it is done more often as a guide to the quantity of a definite mixture to be given than as a method of determining the quality of the food or the percentage of sugar to be added.

This dependence upon the use of milk sugar to make a food of the proper nutritive value for the infant might seem a priori to be a rational procedure, as lactose is the form in which nature administers carbohydrates to all suckling animals. That there may be some doubt, however, as to its efficiency is brought out in an article by Richard Weigert.¹ In his position in charge of the city milk dispensary in Breslau, he was able to study a large number of healthy and ill infants. Before he took charge, the routine diet given to the very young infants requiring artificial feeding was a mixture consisting of one part whole milk and two parts of a 10 per cent. lactose solution. On a certain day he stopped all the lactose distribution from the dispensary, and in its stead diluted the milk with plain water. The results were watched with great care, and it was shown that the infant's weight increased as rapidly and as regularly without the milk sugar as it did with it. Certain symptoms, such as redness of the mouth and frequent thin, slimy stools, which had been common, disappeared immediately. No increase of constipation nor the passage of soapy stools was observed. For the last year all infants fed from the Breslau Dispensary have received mixtures without the addition of the lactose, and have gained as well and have generally been in better health than before.

A point of even greater interest than the inefficiency of lactose is, if Weigert's charts are to be believed, the gain in body weight of his patients on a diet so extremely weak that, according to the tables of Heubner, it should be quite incapable of sustaining life. According to these charts, Weigert's infants, before the elimination of milk sugar, received but some seventy calories of food per kilogram of body weight, and afterward between twenty-five and thirty-five calories. Though the amount of milk was rapidly and disproportionately increased soon after the lactose was stopped, it rarely got above fifty, and never above seventy-five, calories per kilogram. The fact that an infant can gain weight and thrive on such an extremely low diet is quite contrary to the teachings of Heubner and his school. If these results of Weigert,

¹ *Berliner klinische Wochenschrift*, May 24, 1909.

which have stood the test of time for a year, continue, a new minimum limit may have to be given to our rules for the energy requirement of healthy and ill infants.

Lackner,¹ of Chicago, presents an article demonstrating Heubner's system of infant feeding expressed in calories, and Teimer,² of Newark, contributes a lengthy article upon the same subject, replete with algebraic formulas, which it is impossible to satisfactorily abstract. Bowditch,³ of Boston, presents a method for determining caloric values of formulas based upon percentage feeding of infants.

From a reading of recent literature, it would seem that the caloric method of infant feeding in this country has not been largely accepted. While a caloric computation may suggest the quantity of food to be prescribed, it must give inadequate information as to the quality of a mixture. The relationship between the heat-producing capacity of a food and the energy it induces in an animal eating it is also a factor of uncertainty. Moreover, the energy requirements of infants has not been worked out with any degree of certainty.

In considering middle milk mixtures, Hess,⁴ of New York, says that because of the larger number of bacteria in top milk, he has for a year used the lower layers, and concludes his article as follows: Experiments prove that in bottled milk bacteria not only rises with the cream, but that they are present in greatest numbers in its uppermost layer. The upper two ounces of cream, therefore, if discarded, carry with it many pathogenic bacteria. Milk deprived of the upper two ounces is called "middle-milk," and the preparations obtained from such milk are termed "middle-milk mixtures." By this method the same fat and protein percentages are now prescribed as in the popular "top-milk" preparations. Schloss,⁵ of New York, carried out certain experiments in the Research Laboratory of the Board of Health, which show that in the coagulation of milk many of the bacteria are included in the clot, and the whey contains far fewer bacteria than the milk from which it is made.

The use of *lactated milk* in the dietary of children has received a moderate amount of attention during the year, but apparently its use is on the wane. It was not to have been expected that the extraordinary expectations raised in some quarters would be realized. Koeppe,⁶ speaks highly in the praise of *buttermilk* as an infant food. He uses a buttermilk gruel made of sour cream of not too great acidity. Buttermilk, whenever used, should be made each day. He employs a mixture consisting of a liter of buttermilk, 60 gm. cane sugar, and 15 gm. wheat

¹ Journal of the American Medical Association, October 16, 1909.

² Archives of Pediatrics, January, 1909.

³ Ibid.

⁴ Medical Record, June 19, 1909.

⁵ Archives of Pediatrics, June, 1909.

⁶ Berliner klinische Wochenschrift, July 14, 1909.

flour, thoroughly boiled. Kerr,¹ of Brooklyn, reports the use of lactated milk in 96 cases, and advocates its employment in the following conditions: In difficult feeding cases, when the various modifications of milk are not well borne, and particularly if there is diarrhea as an accompaniment; in fermentative diarrhea, where its use gives an almost uniformly immediate beneficial result; in the eliminative diarrheas, which so often accompany the general diseases, and particularly the acute infectious diseases; in chronic diarrheas, in which it offers enough relief to warrant its extended trial. The probability of its beneficial effect in the specific intestinal infections should be borne in mind and made use of. There seems to be no age at which its effect is more marked than at another, the youngest infant and the older children being influenced alike by its administration in proper proportions.

During the summer of 1908 Kerley and La Fetra² made extensive use in the Babies' Hospital of milk soured with tablets containing a pure strain of lactic acid bacillus. The milk was prepared in the diet kitchen of the hospital, one tablet being dissolved in four ounces of water and mixed with one quart of milk. This mixture was allowed to stand from twenty-four to forty-eight hours. It was then diluted with water or cereal water and milk sugar or cane sugar was added. The dilution depended upon the age and assumed digestive capacity of the patient. The child's caloric requirements were considered in each case. Two groups of children were treated. The first group of fifteen were distinctly feeding cases, varying in age from one to sixteen months. The results were so disastrous that the observations were discontinued. The children were not made ill by the soured milk, but simply faded away. In a large experience Kerley had never seen so typical a picture of depression, prostration, and pallor as was shown by this group of babies fed on soured milk.

The second group comprised babies who were fed the soured milk after intestinal disease. It is well known how difficult it is after a severe attack of summer diarrhea to bring the child to a thriving cow's milk diet. It was thought that this protracted convalescence might be shortened by the use of soured milk. It was used in nineteen cases after the subsidence of acute symptoms, when freer feeding might be resorted to. The patients ranged in age from one to fourteen months. Nine were over six months, and two of these were over one year. The milk was used as in group one, the duration of its use being one to sixteen days. The milk was refused absolutely by two. A very rapid loss of weight made it necessary to discontinue it in four others after using it two to four days. Only four of the children gained in weight. But two in the series made a satisfactory showing. The usual methods of resuming stronger feeding gave results that were incomparably better.

¹ Archives of Pediatrics, January 9, 1909.

² Ibid., May, 1909.

The results were so far inferior to the usual methods of treatment that further observations were discontinued.

Dr. Hemenway,¹ in discussing these cases, said that there were two points which impressed those on duty at the Babies' Hospital: (1) There were children who were brought to the hospital, not hopeless by any means, but who were not gaining in weight. The change in some of these babies was so sudden that at rounds it was possible to pick out the ones who were fed on acidified milk. A child might have been bright and cheerful the night before; in the morning it would appear prostrated and pale, with hardly any life at all. (2) The food failed to fatten the children. None of the children made any improvement so far as taking on fat was concerned, and this was especially marked in those cases fed on soured skimmed milk. La Fetra expressed the belief that there is a distinct field for the use of buttermilk. It has little or no fat, and the cases in which it is indicated tolerate fat badly. In patients with putrid stools, alkaline rather than acid, the use of buttermilk is attended with good results. He has had satisfactory results by using fat-free buttermilk for a period of one week or ten days, for the purpose of changing the character of the intestinal contents. The stools, instead of having a foul and putrid odor, change and have an acid odor. When the stools become normal, he changes the diet and uses some other form of food without further use of the buttermilk. He believes there is a distinct field for the use of lactic acid bacilli, but the hospital babies did badly on them.

An extended and highly scientific series of investigations carried on at the Rockefeller Institute upon the effect of milk modifiers upon the gastric digestion of infants is reported by T. Wood Clark,² from which he draws the following conclusions: (1) The motility of the infant stomach varies inversely to the concentration of the food; the more dilute the food, the more frequently may the feedings be given. (2) Lime water does not reduce the acidity of the gastric contents, the neutralizing of a portion of the acid being overcome by an increased stimulation of hydrochloric acid by the gastric glands; this may even increase the amount of acid available for digestion. (3) Sodium citrate acts on the acid in the stomach, converting it into sodium chloride, and thus markedly reduces the "available hydrochloric acid." (4) Barley water seems to have no constant effect upon the chemistry of gastric digestion in the infant. (5) The type of infants who vomit persistently may be divided into two classes, hypo-acidity and hyperacidity. (6) Test feedings should be given to this type of infants to determine to which class they belong. (7) A 5 per cent. milk-sugar solution seems to be the most satisfactory feeding to determine fine differences in the

¹ Archives of Pediatrics, May, 1909.

² American Journal of the Medical Sciences, June, 1909.

gastric contents. This may be followed by a mixture of milk (one part) and water (two parts) to determine to what extent the gastric glands are capable of responding to stimuli. For lactose solution, thirty minutes is the most satisfactory time to allow the feeding to remain in the stomach; for the milk mixture, sixty minutes. (8) On purely theoretical grounds, it would appear that when the acidity is low, either small doses of alkalis or of hydrochloric acid are indicated; while in hyperacidity, sodium citrate holds out the best hope of benefit. (9) Protein digestion in the infant's stomach is slight, and is proportional to the amount of hydrochloric acid in the organ.

A danger in the use of the vacuum bottle is pointed out in an editorial article,¹ in which observations are referred to which show that a bacterial count of 3500 per cubic centimeter increased to 1,400,000. It draws attention to the fact that these labor savers are, in fact, efficient incubators for bacteria. Their excellence as incubators is, however, a dangerous fault, which is shared by all the "coseys" and "warming pockets" advertised so extensively, and with such graphic illustrations. However, in the transportation of food when travelling, the vacuum bottle possesses some very great advantages. Food can be carried in ice boxes, of which there are several on the market, but ice boxes have to be refilled and are clumsy. Food suitably prepared from clean milk can be cooled and placed in vacuum bottles, with the certainty that it will keep cold a much longer time than the ordinary journey requires. It is, of course, necessary for the bottles to remain unopened to retain approximately their original temperature; but even if opened once or twice, they will not become much warmer if not left unstopped longer than is necessary for filling a nursing bottle. The loss in coldness may be compensated for by packing in ice and salt to get a very low original temperature before pouring into the bottles at the time of starting. In this case, care must be taken to keep the food stirred while it is cooling to prevent its freezing.

A simplified method of home modification of cow's milk for infant feeding is presented by Sheffield,² of New York, the advantage claimed being that it requires no memorizing of mathematical formulas.

¹ Archives of Pediatrics, August, 1909.

² New York Medical Journal, October 23, 1909.

RHINOLOGY AND LARYNGOLOGY.

By D. BRADEN KYLE, M.D.

THE NOSE.

Taking Cold. The expression "taking cold" is always one of interest to every practitioner of medicine, whether general or special, and in reviewing the literature of the year I find no subject of greater importance than this.¹

The expression "taking cold," as so frequently used by patients, and sometimes by medical practitioners, is in many instances a misnomer. The rhinologist often sees the individual with a condition resembling a cold, in which there is no history of exposure nor usual systemic phenomena, and yet, to all intents and purposes, the patient is suffering from a cold in the head, or has taken cold.

The condition of taking cold may be divided into three classes: (1) Actual cold, or acute rhinitis. (2) An underlying systemic condition which produces some local manifestation and irritation in the mucous membrane, predisposing the individual to taking cold. (3) An underlying systemic condition in which the patient has not taken any cold, but the symptoms produced in the mucous membrane are those of a cold.

The first condition is a separate and distinct process, a simple acute rhinitis. The second is a compound process, a systemic condition and a local process. Just what particular function is wrong is to be determined by the practitioner, but the systemic condition predisposes the individual to cold; in other words, it lessens the vitality of the mucous membrane and lowers its resistance. And in the third condition—let it be neuroses, let it be a circulatory, a vasomotor or chemic, or an organic or systemic lesion, which is locally manifested in the mucous membrane of the upper respiratory tract—the irritation thus produced in this local manifestation produces a lesion identical with that of having taken cold. In other words, a patient may have every symptom of cold in the head, and yet have not been exposed; in fact, just as likely he may have been seated before the fire in a comfortable, well-ventilated room, free from draughts or exposure.

Taking cold, then, implies more than a local condition. It may

¹ Proceedings of the American Laryngological, Rhinological, and Otological Society, 1909.

be dependent on constitutional conditions, either original or acquired. Certain individuals, under varied conditions, are more susceptible to cold at one time than another. At certain times a person may be exposed and not take cold, yet at another time, without any apparent rhyme or reason, he takes cold. This cannot be explained on any other basis than an individual systemic or constitutional condition.

The lithemic condition, where the patient, without any exposure whatever, may suddenly develop a severe cold, is also classed under the ordinary term of "cold." This, however, is due to the faulty chemistry of the secretion, where the glands of the mucous membrane, in pouring out their secretion, this secretion having been perverted, produce an irritating mucus, causing every symptom of a severe cold in the head. Individuals with rheumatic, gouty, or lithemic diathesis are especially predisposed.

It narrows the matter down to a question of personal or individual equation and the individual and personal study of every case as to why the individual takes cold, as to what form and course this so-called cold pursues, and why on one occasion without exposure he takes cold, and on another occasion, after being exposed, he does not take cold.

Nasal congestion, causing mouth breathing and continual symptoms of cold in the head, as observed in boys and girls at the age of puberty, we all know is due to a physiological process. It is in reality a physiological hyperemia of the erectile tissue. Why, then, sacrifice this membrane? Why cauterize, cut, or burn this perfectly normal tissue? Local treatment does practically no good, but in the course of a few months, or when the individual has passed through the age of puberty, you will find that this tendency to take cold in the head, or the chronic condition of cold in the head, has disappeared, and instead of having a scarred and irritated mucous membrane you now have a perfectly normal and healthy tissue.

The same is true in regard to local treatment and surgical interference in a vast majority of these conditions. To be sure, sometimes sedative local treatment may give a certain degree of comfort to the patient, and the nasal congestion may be so marked as to threaten involvement of the Eustachian tube and middle ear, or of some of the accessory cavities. Then, and only in such cases where the threatened danger would be greater than the loss of a certain portion of the tissue, should operative interference be offered. In many instances where the local condition is really a local manifestation of a systemic condition, solutions and treatments applied locally only aggravate the already irritated tissue, and the treatment should be directed toward the removal of the underlying cause. It is obvious, therefore, that no one line of treatment can be applied in all cases, and that the individual must be studied as carefully for the predisposing cause or underlying element as though typhoid fever or a beginning pneumonia were suspected. In

other words, every individual case should be studied from an individual standpoint. The individual study of cases enables the physician to scientifically apply his remedial agent and not empirically prescribe a cold remedy. My own experience has been that out of one hundred persons presenting themselves for relief of what they call a cold in the head, or having taken cold, or frequently taking cold, at least 80 per cent. belong to the class of the systemic condition, either constitutional, organic, or chemic.

In speaking of the mechanical factors in taking cold, David C. Hilton¹ says that cold taking, from a mechanical point of view, is merely an incident in the history of a poorly drained nasal apparatus. To ascertain the relation of cold in the head to nasal drainage, it is only necessary to associate the symptom complex with concomitant anatomical peculiarities in the nasal cavity. The primary exciting cause of the cold, whether a specific organism, local irritants, lithemia, intestinal auto-intoxication, atmospheric changes, etc., brings on increased nasal secretion, congestion, and tumefaction of the submucosa, with stoppage of part or all of one or both cavities. Incident to mechanical and physiochemical changes in the soft parts, the sensory nerve endings therein are often stimulated to entail reflex symptoms, such as sneezing, headache, lacrymation, etc. The ensuing hyperpyrexia, malaise, anorexia, etc., point to a general intoxication, which may be due to the action of the primary exciting cause, to secondary infection in the pent-up secretions, or to independent physiochemical changes in the affected tissues. If drainage of the nasal cavities is not reëstablished by interference, the cold pursues a self-limited cycle, the secretion changing from watery to mucoid, and thick mucopurulent. If drainage is promptly reëstablished, the symptom-complex subsides more rapidly. If adequate distributive drainage is maintained before the mucous membrane has become pyogenic, the complex disappears with greater spontaneity.

Curative measures look to the inhibition or the abortion of the attacks. Treatment from an etiological standpoint suggests the removal of the primary exciting cause. In routine practice this is largely impractical, as it may demand changes in the patient's environment, habits, or constitution that cannot be accomplished. As a substitute measure, the action of the primary cause may be inhibited ordinarily, and acute attacks mitigated by altering certain mechanical peculiarities in the nasal cavities. The means of altering the structural relations in the nasal cavities may be divided into those that effect transitory and those that effect permanent modifications. The remedies having a transitory effect act only on the soft tissues, and especially on the erectile tissues of the turbinate bodies. They include several internal remedies

¹ Laryngoscope, February, 1909.

—massage, electricity, dry and moist heat or cold, changes in atmospheric pressure and humidity, topical applications to the surface of the cavities, and hypodermic injections in the course of the principal nerves conveying afferent impulses from the nasal mucosa. Topical applications to the nasal cavities reestablish drainage to the extent that they reduce the tumefaction of the soft tissues. The effect of all these topical applications is transient, and their dominant therapeutic virtue is palliation. Their important value and proper use is as symptomatic remedies to relieve acute attacks. To alter permanently any mechanical deviations in nasal structure, they are of no avail.

The permanent reestablishment of adequate distributive drainage of the nasal cavities is a mechanical problem, and is successfully accomplished by mechanical means. The means to this end include chemical cautery, the actual cautery and galvanocautery, electrolysis (submucous, unipolar, and bipolar), incisions (simple incisions, resections and exsections), écrasement, torsion, dilatation (splints, tents, instrumental dilators, etc.). The cardinal principles to be observed are: The correction of fixed deformities and the prevention of transient malpositions; the conservation of tissues; the destruction of tissues.

For the correction of fixed deformities involving bony tissues, incisions, écrasement, or mechanical appliances are usually elected. The utility of splints in correcting deviations of the nasal septum comes far short of popular expectations, and they are often unduly severe in proportion to the benefits received. Splint operations improves patency of the affected side, as evidenced by freer aëration, but do not necessarily correct faulty drainage to a corresponding degree. An operation, such as partial submucous resection of the cartilaginous and bony septum, by a unilateral flap, is done with greater comfort to the patient, and followed by more desirable therapeutic effects. For the correction of deformities confined to the soft tissues, the cautery or electrolysis is often substituted for incision.

The prevention of transient malpositions means the inhibition of intumescent and edematous conditions, and is commonly attained by linear cauterization or incision. To locate adventitious, circumscribed edemas in the nasal cavities often requires persistent hunting, and for them to elude the watchfulness of the clinician may mean therapeutic defeat. In order to discover the area involved, patients may be required to present themselves at any time the symptoms come on.

The principle of the conservation of tissues is precautionary, that the latter end be not worse than the first. The nasal apparatus is a combination of delicately balanced physiological mechanisms, and surgical interference should be strictly limited to those features of morbid anatomy that unbalance normal functions. To overstep this limit is meddlesome and unsurgical, and may add to a burden of ills. Unless otherwise indicated, cauterizations should be linear, or

electrolysis used to save needed mucosa, and partial resections should be substituted for ablations. The unnecessary sacrifice of soft tissues should be avoided by flap operations. Thorough work should be done at each sitting, as several slight operations may destroy more valuable tissue than one radical procedure. So far as this principle applies to nasal drainage it should be remembered that the latter function depends on a proper balance between cavernal dimensions and cavernal surfaces, secretion and evaporation. When the nasal cavities have too great diameters and too little secreting surface, drainage is inadequate from evaporation and desiccation of secretions on the nasal walls. This latter condition, being associated with atrophy of the glandular tissues and perverted secretions, is to be avoided. When meddlesome surgery overdoes matters in "cleaning out" the cavities and cures the patient of the tendency to recurrent cold taking by substituting a condition akin to atrophic rhinitis, it neither relieves suffering nor prolongs life.

In concluding his paper, Hilton says that the therapeutic importance of the mechanical factors in taking cold does not supplant the desirability of removing primary exciting causes; nor dissipate the necessity of symptomatic treatment by the internal and topical use of medicines and other agencies in acute attacks; nor forestall the value of physical and chemical researches into the unexplored physiology of the affection. It does not appear possible to maintain absolutely perfect and uninterrupted nasal drainage, nor, if it were possible, does it follow that this would immunize a person against all inflammatory attacks. The recognition of the mechanical factors in cold taking does, however, give a perspective, wherein the taking of nasal cold is ordinarily seen to be incident to abiding mechanical defects. Thus far it can demonstrate that the relief or abortion of acute attacks implies the reestablishment of drainage and near-constant air pressure, and that herein is a basis of procedure which prevents attacks by disallowing the action of the primary exciting cause, and modifies them by removing a necessary line in a chain of sequences.

Charles P. Grayson¹ calls attention to the fact that many serious complications, such as inflammation of the accessory sinuses, purulent otitis media, optic neuritis, orbital cellulitis, and even cerebral abscess, may follow the neglect or improper treatment of a simple cold in the head. He believes that in all patients who suffer from frequently recurring colds, especially those who have a chronic rhinitis, there is some underlying cause. This he has found in the majority of cases to be an intestinal toxemia. An acute coryza, therefore, represents the results of a triple pathogenetic alliance, a chronic rhinitis, a chronic intestinal toxemia, and exposure to cold or some irritant, such as dust, microbes, etc.

¹ *Therapeutic Gazette*, May, 1909.

Grayson's treatment consists in first administering a cathartic, preferably one of the natural saline waters. The patient should fast for twenty-four hours, and several times during this period he should for fifteen or twenty minutes, indulge in the most vigorous exercise of which he is safely capable. With appropriate modifications this advice applies to men, women, and children, and in this way the heart action is quickened and invigorated, and the skin, bowels, and kidneys become active eliminating organs, the engorgement of the nasal mucous membrane rapidly subsides, and its effects are quickly obliterated. If drugs are employed, Grayson recommends the salicylates, also a few drops of aromatic spirit of ammonia, or tincture of nux vomica, which aid in elimination. He is opposed to the use of combinations of opium, belladonna, aconite, and acetanilide. In old or debilitated patients, where active exercise is contra-indicated, diaphoresis may be promoted by means of the cabinet bath or some other mild method.

As to the local treatment, Grayson uses a preliminary spray of a 2 per cent. solution of cocaine, not more than two or three drops in each nostril. This anesthetizes and shrinks the inferior turbinates, and the cocaine solution is now applied to the upper part of the nares by means of a cotton-wrapped applicator, after which the entire nasal cavity is thoroughly flushed with an alkaline antiseptic wash. The patient is directed to draw the solution back into the nasopharynx, so that this cavity is also cleansed. The mucous membrane is next soothed by the insufflation of some bland powder, such as stearate of zinc. Following this a spray of chloretone inhalant or adrenalin inhalant is used, which prolongs the effects of the treatment.

Treatment of Nasal Congestion. The application of cold to the back of the neck for the relief of nasal congestion has been employed with success by Muck,¹ after the suggestion of Winternitz. He has found that cold water poured over the back of the neck, or a cold douche applied for a few seconds, has a decided influence in relieving congested conditions in the nose and also bronchial asthma if it is due to a nasal reflex. He ascribes the result to the direct action upon the vasomotor and respiratory centres; the same effect is not obtained by the application of cold elsewhere on the body, nor by the mere application of cloths wrung out of cold water. The mechanical stimulus of the pouring water seems to be an important element in the relief experienced. Before dressing in the morning the simple application of the cold douche to the back of the neck gives great relief in simple chronic rhinitis, and is liable to relieve the suffocation of asthma.

Intestinal Auto-intoxication in Diseases of Nose and Throat. Further observations, confirmed by clinical and laboratory data, substantiate the views already expressed by J. A. Stucky² as to the cause of lithemic

¹ Münch. med. Wochenschrift, July 20, 1909.

² Journal of the American Medical Association, October 9, 1909.

nasopharyngitis. In several hundred cases of diseases of the accessory sinuses, middle and internal ear, in which surgical interference was not indicated, and in all in which it was indicated and operative procedure resorted to, he has found unmistakable and marked evidence of toxemia of intestinal origin, as evidenced by excessive quantity of indican in the urine, and when the condition causing this was removed there was marked amelioration or entire relief of the disease. The condition known as lithemia sometimes brings about contraction of the circulation, resulting in hyperemia or ischemia with venous stasis. Quinine and salicylates cause tinnitus probably by producing hyperemia of the labyrinth, as they increase the blood pressure until actual toxic effects are manifested, when the pressure is reduced. The same conditions result from imperfect or overnutrition and defective elimination. Prolonged interference with function due to toxemia may result in organic changes. Foods and drugs once in the circulation select the nervous function which they specifically derange. Lithemic and uremic poisons must accumulate a long time before their effects become manifest. More attention should be directed to the radical systemic treatment and hygienic living in the management of pathological conditions of the nose and throat.

Treatment of Chronic Diseases of the Nose. Sprenger¹ offers a new procedure for the treatment of chronic conditions of the nasal mucous membrane. He says that when the nasal mucous membrane becomes chronically affected from any cause, the nose does not act as under normal conditions; it does not receive the physiological stimulus necessary to health; it changes still more into a condition of disease, and for this reason again it does less work. This he terms a "circulus vitiosus." To bring about an improvement in the diseased part we must provide for longer pauses for rest; that is, we must bring about a temporary state of rest, and for this the mechanical, thermic, and chemical stimuli must be kept back as much as possible. To accomplish this, Sprenger constructed small, clear yellow balls or pellets, of porous India rubber, the so-called sponge rubber. They are about 12 mm. in diameter, and are furnished with a stalk for the purpose of easy handling and cleanliness. These little balls are inserted into the lower part of the nostril and retained there for from half to three-quarters of an hour several times a day. First, a feeling of fulness is felt in the nostril, but also one of increased warmth. Very soon, however, a feeling of great relief comes on. The sensation of dryness that is often so troublesome disappears as the increased blood supply increases the secretory action of the glands. When the pellet is removed the nostril that has carried it is free, just as after an application of a weak solution of cocaine, and agreeably moist. It can now be cleansed easily. This

¹ Medical Press and Circular, London, August 18, 1909.

condition of relief often lasts from one to two hours, and when it passes off can easily be brought about again by the same means. Wearing the pellet regularly for several months is said to cause a marked improvement, or even complete recovery.

Recurrent Nasal Hemorrhage. Raymond Spear¹ reports an interesting case of recurrent epistaxis, in which considerable difficulty was experienced in controlling the bleeding. The patient had sustained a fracture of the left nasal bone, the vomer, and mesethmoid. At the time of the injury there was considerable hemorrhage from both nostrils. The hemorrhage was controlled by packing. There was severe hemorrhage on a number of occasions afterward. The nature of the hemorrhage was peculiar; the bleeding was profuse while it lasted, and stopped apparently when the blood pressure lowered. Several careful examinations of the nasal cavity failed to reveal the source of the bleeding, but in all probability the bleeding point was situated in the right side of the mesethmoid region. The blood either came from a small artery that had been partially torn by the bone fragments or may have come from a damaged plexus.

There was no hemophilia in the boy's history or in the history of the family. As the case progressed and the boy lost more blood, he became more anemic. His condition was critical, and it was imperative to control the bleeding. Both facial arteries were tied without success. It was noticed that pressure over the right common carotid stopped the bleeding, so under cocaine anesthesia the carotids on the right side were exposed; the external was ligated and a ligature was placed around the internal, but was not tied. This procedure controlled the hemorrhage for thirty hours, when it recurred, but to a much less degree. Finally, both nares were plugged with strips of gauze supported by Kyle's long nasal splints. This procedure controlled the hemorrhage. The following day these splints were removed; the bleeding again started, but was controlled by placing two long plugs made of twisted cotton soaked in a solution of boric acid; these plugs were placed in the right nasal chamber well back and upward, on the mesethmoid, and held in position by one long Kyle nasal splint. These plugs were left in place for forty-eight hours, the nasal cavity being kept fairly clean by dropping a little boric acid solution into the splint every two hours. The plugs were gently removed and replaced by others of a similar character, which were also left in position for forty-eight hours. These were replaced by one plug, which was left in for twenty-four hours. No bleeding occurred after the introduction of the cotton plugs. During the progress of the case gelatin was given in large quantities by the mouth, as was also calcium lactate and injections of

¹ United States Naval Medical Bulletin, July, 1909.

30 c.c. of rabbit's serum, all with the idea of increasing the coagulability of the blood.

Nasal Tamponade. A new method of packing the nasal cavity is described by J. Wolff¹ as follows: The tampon consists of a long strip of iodoform gauze which is folded several times upon itself, the edges being turned in until a thin tampon about twelve inches long and about three-quarters of an inch wide, containing eight layers of gauze, is formed. The open side of the tampon is sewed up along its edge. At the anterior end of the tampon is attached a strong silk cord about fifteen inches long, with a single knot at its free end. This is called string No. 1. Three inches behind the point of attachment of string No. 1, string No. 2 is attached, and its free end drawn through the interior of the tampon until it emerges just behind the attachment of string No. 1. String No. 2 has two knots at its free end and is a little shorter than string No. 1. String No. 3 is attached three inches behind string No. 2, and also is led through the tampon, emerging behind string No. 2, and has three knots at its free end, and is a little shorter than string No. 2. The same process is repeated with strings Nos. 4 and 5, each having its corresponding number of knots, and being a little shorter than the preceding one. String No. 5 is attached to the posterior end of the tampon.

In introducing the tampon, a separate string is passed through the nose and out of the mouth in the usual manner. The five strings of the tampon are attached to the mouth end of this string and drawn through the nose by pulling on the nose end. The five strings are then pulled together until the anterior end of the slender tampon appears at the nostril. The thumb of one hand is then pressed against the nostril, and string No. 1 is allowed to hang down. The remaining four strings are then pulled on together, while firm counterpressure is made with the thumb. This has the effect of throwing the section of the tampon between strings Nos. 1 and 2 into folds, and of evenly advancing the remainder of the tampon. When traction causes no further yielding of the tampon, string No. 2 is dropped and the three remaining strings are pulled together. This causes the section between strings Nos. 2 and 3 to fold up and the rest of the tampon to advance into the nose. This process is repeated until the whole tampon is firmly packed in the nose and the bleeding controlled. To facilitate the rounding of the soft palate by the tampon, a flat ring attached to the posterior surface of a flat palate retractor is used, the strings of the tampon passing through this ring as they enter the pharynx. The tampon is removed through the anterior naris, which obviates the necessity for leaving a string in the mouth.

A much less complicated method, and one that is designed especially

¹ Laryngoscope, February, 1909.

for the prevention of postoperative hemorrhage, is that described by W. E. Casselberry.¹ He introduces into the naris a rubber tent with a slightly bulbous end, inserting it sufficiently far back to allow the bulbous end to extend into the nasopharynx. The tent is then packed with gauze by means of an ordinary tubular packer, at first with special firmness, so as to produce overdistention of the bulbous extremity and thus form a posterior plug.

Treatment of Hay Fever. In a series of 80 cases of hay fever observed by Scheppegrell,² ragweed was the causal factor in every case except one, which was undoubtedly due to goldenrod. The pollen of the ragweed is not simply a mechanical irritant, like dust, as is usually supposed, but it contains a pungent aromatic compound which acts as an irritant on the nasal mucous membrane. As a scientific basis for the prevention of hay fever, one must either cause the entire disappearance of the plant which produces the causative factor of the disease, or must artificially develop in patients susceptible to it that degree of tolerance which naturally exists in persons not suffering from hay fever. The former is neither possible nor practicable. The alternative, therefore, is the development of an artificial tolerance to the irritating pollen in persons subject to hay fever. Such a tolerance is gradually developed in the progress of the disease.

As the staminate flowers of the ragweed contain its pollen, these are made use of by Scheppegrell. At a period of time varying from two to six weeks the pollen of the staminate flowers is inhaled by the patient. These inhalations are at first made two or three times a day, and later, as the time of the usual development of the disease approaches, more frequently. The inhalation is followed by a slight attack of sneezing, some lacrymation, and a watery discharge from the nostril. As no inflammation exists, these effects are not disagreeable nor painful, and ordinarily pass off in the course of an hour. If the patient takes a walk or other form of exercise immediately after the application is made, the congestion of the mucous membrane is less marked. In a few days the applications produce less reaction, and more pollen may be inhaled and the inhalations made a greater number of times. Gradually the reactions become less, and finally are not observed by the patient. When this is the case the patient is immune to an attack of hay fever at this time.

This immunity is not permanent, and therefore the treatment should not be discontinued until the regular advent of the hay fever season, when it should be entirely discontinued, as the natural pollen of the air takes the place of the artificial inhalations. Scheppegrell believes that if the staminate inhalations are resumed after the cessation of the

¹ Illinois Medical Journal, March, 1909.

² New York Medical Journal, December 4, 1909.

hay fever period, a permanent tolerance will gradually be developed which will give the patient permanent immunity.

OPERATIVE TREATMENT OF HAY FEVER. Bloss¹ reports three cases in which the tendency to hay fever was cured by the resection of the anterior ethmoidal nerve on both sides for the purpose of inducing permanent anesthesia of the mucous membrane of the anterior part of the nose. The operation may be performed under chloroform anesthesia, local anesthesia alone, or local anesthesia with morphine.

Nasal Tuberculosis. W. Scott Renner² reports a case of nasal tuberculosis in a healthy woman, aged twenty-eight years, whose nose was completely obstructed by a pyriform tumor occupying the position of the septum. A provisional diagnosis of sarcoma was made, and a small portion of the mass removed for microscopic examination, which showed it to be tuberculous, containing giant cells and bacilli. The lungs were normal, the heart not very strong, and there was a history of old glandular abscesses in the neck. The growth was removed piecemeal down to the cartilage, and later the anterior portion of the inferior turbinate, which was found to be infiltrated. The wound surfaces were treated with lactic acid and the edges cauterized with the electrocautery. Iodoform gauze was used as packing until healing occurred. Renner is not sure that this was a primary infection in the nose, in view of the old scar in the neck. The septum probably became involved first, and the turbinate later.

Generalization of nasal tuberculosis by way of the meninges is an exceedingly rare complication, but one case being on record, to which A. J. Huey³ adds another. His patient gave a history of increasing difficulty in nasal breathing for a period of four years, accompanied by profuse purulent discharge from the left naris. Headache had been severe at times, but not persistent. Examination showed the left nostril to be completely filled by a mass of friable vascular tissue, a piece of which was removed for microscopic diagnosis and found to be tuberculous. Three portions of the growth were then removed, forming a mass of tissue the size of an English walnut. This established nasal respiration, and the patient was much relieved. Before removal of the growth it was impossible to determine from what part of the nasal cavity it originated. After operation large ulcerations were seen on the septum and also on the outer wall of the nasal chamber, the turbinates having been destroyed beyond recognition. Three weeks after the removal of the first portion of the nasal growth the patient complained of headache and vertigo, tinnitus aurium and deafness. These symptoms increased in intensity for four days, when a high fever developed with delirium followed by strabismus, ptosis,

¹ Deutsche med. Wochenschrift, August 26, 1909.

² Annals of Otology, Rhinology, and Laryngology, September, 1909.

³ New York Medical Journal, August 7, 1909.

and coma. The patient died eight days after the onset of the meningeal symptoms.

Knight accounts for the rarity of this complication by the fact that the flow of lymph is from the brain toward the nasal cavities, a fact which bears an important relation to all infections of the nose and accessory sinuses. The operative interference may possibly have had some influence upon the spread of the infection to the meninges in this case. No attempt was made to eradicate the disease by operation, only enough of the growth being removed to establish the diagnosis and relieve the symptoms.

SURGICAL TREATMENT OF NASAL TUBERCULOSIS. In primary tuberculosis of the nose, Onodi¹ recommends complete removal of the nasal mucous membrane, as this method not only removes the primary tuberculous changes, but also the possibility of leaving behind latent areas to carry on the disease. He mentions cases in which this was done and a recurrence occurred in from nine months to two years. The operation is indicated only in primary tuberculosis of the mucous membrane. In general tuberculosis with secondary lesions of the nasal mucous membrane, the latter should be treated locally.

INTRANASAL TUBERCULIN REACTION. Lafite-Dupont and Moulinier² describe their procedure for producing a diagnostic reaction of tuberculin on the nasal mucous membrane. An exudate ensues which desiccates and forms a yellowish crust reposing upon a congested mucous membrane, of which the extravasated red corpuscles cover the crusts with little hematic points. The experimentation was made upon 100 patients, taken at random, and a reaction occurred only in the tuberculous subjects. The method is claimed to be as certain as the ophthalmic reaction, and has the advantage over the former of being innocuous.

Scleroma of the Upper Respiratory tract. J. H. Guntzer³ has correlated all the collected facts regarding scleroma of the upper respiratory tract, and reports two cases treated with vaccines. His conclusions are:

1. Scleroma is an infectious disease, whose onset has occurred even in infancy, but usually begins in adolescence, and does not show itself only in adult life, as some still believe.

2. The so-called Frisch bacillus plays an important role in the causation of scleroma, being found in the exudate and in the tissue proper, and the author's work, proving that a vaccine prepared from the Frisch bacillus can create at least a local immunity, is a further point favorable for the etiogenesis of the Frisch bacillus in this disease.

3. The Frisch bacillus has a lively and lasting motility when examined in the hanging drop, and it grows smaller and thinner as the age of the

¹ Berliner klin. Wochenschrift, August 30, 1909.

² Annales des maladies de l'oreille, du nez, et du pharynx, May, 1909.

³ Laryngoscope, June, 1909.

culture increases, as observed by the writer. From the agglutination test, also applied here for the first time with the Frisch bacillus, no conclusion can be drawn. Further tests on patients whose immunity has not been influenced by inoculations might prove valuable.

4. In the biological experiments, the time factor has been overlooked, and in the future, in so chronic an affection as scleroma, a long time for observation must be allowed.

5. The writer believes that a parasite or insect may be the means of transmission for this disease, and when discovered will supply the missing link for the infectious etiology of scleroma.

6. Even allowing its contagion to be mild, at some time the immigration or health authorities in the United States may have to adopt some means to limit the increase in the scleroma cases.

7. The examination of a small piece of tissue leads to fallacy in histopathological diagnosis; therefore, examine as large a piece as possible.

8. A deformed contour of the external nose is only found in a small percentage of cases.

9. Metastasis does rarely occur in scleroma.

10. The diagnosis of scleroma, at least in the early stages, is not easily made, and the clinical course must be taken into consideration along with the bacteriology and histopathology in order to arrive at a correct diagnosis.

11. Scleroma does not render a patient immune to other infections; but other infections may favorably antagonize the scleromal process.

12. At this time the *x*-ray treatment holds out the best prospects of a positive cure for scleroma. The vaccine treatment has at least caused a local immunity, and may be a means of possible cure if used for a long time and, as to frequency and quantity, in proper dosage. With no criteria to guide the author's original work in this disease, these points in the vaccine treatment still need to be worked out. Surgery has only an elective place in the treatment of scleroma, and is useful only as an auxiliary.

Sarcoma of the Nose. According to Price-Brown,¹ the usual point of origin in sarcoma of the nose is in the soft tissues, and not in the bony framework which supports them. The origin is usually in the form of a pedicle, which rapidly becomes sessile. As the sarcomatous mass enlarges and presses upon the surrounding mucosa, abrasions take place, and these are quickly transformed into adhesions. These adhesions in time become almost co-extensive with the disease itself. These adhesions never attain the vitality and virility possessed by the pedicle. When once destroyed they do not reform. Recrudescence may, however, take place in the region of the pedicle, and in view of

¹ *Journal of Laryngology*, London, October, 1909.

this contingency, this region should be kept under regular observation and control. Owing to the fact that in many cases of nasal sarcoma the affected cavity becomes entirely filled by the hemorrhagic growth, that its adhesions are extensive, and that it is impossible at the time of examination to locate them, attempts at intranasal removal by the ordinary knife are inadvisable, but gradual and systematic dissection by the cautery knife, in suitable cases, is a method which is always available and should be encouraged. Several recent cases are reported.

THE NASAL SINUSES.

Relation of Optic Nerve to Nasal Sinuses. Hanau W. Loeb¹ reviews the literature on the subject and gives the results of his study of fifteen heads, with respect to the relation of the optic nerve to the accessory sinuses of the nose, and summarizes as follows:

1. The sphenoid sinuses vary as follows: Anteroposterior diameter, 2 to 42 mm.; supero-inferior, 4 to 36 mm.; lateral, 2 to 35 mm.; averaging, respectively, 21.5, 22.8, 18.4.

2. The opening of the sphenoid into the nose, in the great majority of cases, is about midway between the floor and the roof of the sinus. In some instances it is much closer to the roof.

3. The diameter of the ethmoid labyrinth and its component parts, the anterior and posterior ethmoid cells, vary as follows: Labyrinth, anteroposterior, 22 to 54 mm.; supero-inferior, 17 to 59 mm.; lateral, 9 to 28 mm.; anterior ethmoid cells, anteroposterior, 9 to 40 mm.; supero-inferior, 7 to 57 mm.; lateral, 7 to 29 mm.; posterior ethmoid cells, anteroposterior, 13 to 32 mm.; supero-inferior, 6 to 38 mm.; lateral 8 to 28 mm.

4. The diameters of the frontal sinus vary as follows: Anteroposterior, 9 to 33 mm.; supero-inferior, 14 to 51 mm.; lateral, 7 to 42 mm.

5. The diameters of the maxillary sinuses vary as follows: Anteroposterior, 17 to 42 mm.; supero-inferior, 17 to 47 mm.; lateral, 7 to 33 mm.

6. The optic chiasm is usually in relation with one or both sphenoid sinuses; in no instance, in these heads, with the ethmoid. In more than half of the heads it lies posterior to the sphenoid cavity.

7. The optic nerve may be divided into a sinus portion and a free portion, of which the former is usually the larger, as shown by the variations, as follows: Optic nerve, 34 to 55 mm.; sinus portion, 17 to 32 mm.; free portion, 12 to 28 mm. So far as could be ascertained, there is nothing in the extent and shape of the sinuses to account for the variation in the length of the nerves.

8. In five instances (one-third) one sphenoid was in relation with both optic nerves, the other sphenoid not participating; in two, the

¹ *Annals of Otology, Rhinology, and Laryngology*, June, 1909.

other sphenoid participates in the relation, and in one there was no relation between either sphenoid and one of the optic nerves.

9. There is a considerable variation in the distance between the optic nerve and the level of the lower margin of the nasal opening of the sphenoid from 2 mm. above to 14 mm. below. In four instances the opening is at the level of, or above, the optic nerve.

10. As a rule, the last posterior ethmoid cell (sometimes there are two) has a very slight relation with the optic nerve, at the postero-external angle just at the roof, and from this point the nerve passes externally to the bulbus, gradually increasing the distance which separates it from the labyrinth. In one instance an anterior ethmoid replaces the posterior ethmoid cell and assumes the usual relation of the last posterior ethmoid cell. When the last posterior ethmoid cell replaces the sphenoid, the optic nerve runs along the external wall of the ethmoid.

11. The frontal is not in close relation with the optic nerve, except when it extends posteriorly in the region of the ethmoid cells. It is commonly in relation with the bulbus, but sometimes it is far removed from it.

12. The roof of the maxillary sinus, forming the inferior wall of the orbit, is below the bulbus and does not reach a distance nearer than 7 mm. from the optic nerve.

In view of the reported cases of optic nerve involvement due to sinus disease, and the anatomic study, Loeb makes the following clinical deductions:

1. Optic nerve involvement without periorbital abscess, although heretofore thought to be an infrequent sequel, is common enough to merit consideration in sinus affections.

2. There have probably been many unreported cases.

3. In all likelihood many minor symptoms resulting from transitory involvement have been overlooked.

4. Whether the infection be lymphogenous or hematogenous, or by contact, the smaller the distance from the infecting focus the greater will be the chance of the involvement of the nerve.

5. It, therefore, is uncommon for frontal or maxillary sinusitis to be accompanied by optic nerve disease without periorbital involvement. However, from their relation to the bulbus, disease by extension through it is not to be overlooked.

6. Sphenoid sinusitis would naturally be called to account as the prolific cause of the infection, but the sphenoid is less commonly affected than the other sinuses, and, except in closed empyema, the pus is evacuated in a large measure through its nasal opening. Stagnant and decomposing pus is more or less common on the floor, in sphenoid empyema, in that part farthest removed from the optic nerve; but this factor becomes more potent where the orifice is at the level or above

the optic nerve, as shown in the four heads, and the likelihood of trouble is greatly increased by the immediate propinquity of the stagnant and decomposing pus, which, in these cases, is separated from the nerve only by a thin lamina of bone and the nerve sheath.

The seven heads out of fifteen, shown and described in this paper, in which one sphenoid was in relation with both optic nerves, afford sufficient explanation for contralateral optic neuritis when caused by sinus disease.

7. The anterior ethmoid cells, which are so commonly affected with suppurative inflammation, are so far from the nerve that they are not likely to influence the optic nerve, except through the effect on the periorbita adjoining. However, where an anterior ethmoid cell is extensive enough to come into relation with the nerve by replacing a posterior ethmoid cell, trouble is more likely to occur.

8. The posterior ethmoid cells, also frequently affected, have very little influence on the optic nerve on account of the meagerness of their relation, viz., the postero-external angle at the roof of the cell, as I have pointed out in this paper. When the cell replaces the sphenoid, and the optic nerve passes along the external wall, then the posterior ethmoid becomes the most potent factor of all, for the nerve is closer to the mass of pus and for a greater distance than under any other circumstances, even though the nasal opening may be in the dependent portion of one part of the cell.

9. It therefore becomes necessary to study more carefully the cases in which the sphenoid orifice is near the optic nerve and in which the sphenoid is replaced by a surmounting ethmoid cell.

Histology of Accessory Sinus Suppuration. A valuable contribution upon this subject is presented by J. S. Fraser,¹ in which he attempts to show that the changes which take place in the mucous membrane of the accessory sinuses in simple acute and chronic inflammatory conditions are analagous to those which occur in the nose in catarrhal and suppurative rhinitis. He claims that these processes occur first of all in the nose and affect the pharynx and accessory sinuses by direct extension, and furthermore, that there is no essential difference between what is called "catarrh" and what is called "suppuration," as one condition passes insensibly into the other. In support of these views, he gives the results of a histological investigation of 19 cases, comprising antral mucosa, 9; ethmoidal, 8; frontal, 1; and sphenoidal, 1.

Only one case of acute inflammation in the mucous membrane of a sinus was met with. This was in the sphenoidal sinus which was obtained at the autopsy on a case of acute pneumonia. The mucous membrane was considerably thickened and deep red in color; the surface was velvety, and the sinus contained some thick mucopus,

¹ Journal of Laryngology, London, September, 1909.

but no blood. On microscopic examination the prominent feature was the extensive hemorrhage in the submucous tissue and the engorgement of the vessels; small-cell infiltration was not so marked as in chronic cases, and the edema was slight in amount; the superficial epithelium was in places markedly disintegrated.

In chronic inflammation there is a more or less thick layer of catarrhal or purulent secretion present on the surface of the mucous membrane, which consists of mucus and leukocytes in various proportions, with occasional epithelial cells. It is remarkable how often the superficial layer appears to be normal, although there are marked changes in the submucous tissue. Not infrequently, however, the number of ghost-cells in the most superficial layer is very large, while in other cases this ciliated layer is absent in parts, and only the spindle-shaped or cubical cells beneath are left. Occasionally the basement membrane is entirely denuded of epithelial covering. In most of Fraser's specimens leukocytes could be seen making their way between the epithelial cells to the surface, there to mix with the mucous secretion and form the mucopurulent or purulent exudation characteristic of sinus catarrh or suppuration. In one and the same specimen mononuclear cells could be seen at one point between the epithelial cells, and at another only polymorphonuclear cells; eosinophiles were also occasionally found in the same situation.

To a smaller extent this process may be observed in the nasal mucosa in cases of chronic catarrh, but in this condition the leukocytes which have come through the epithelium on to the surface are diluted by the large quantity of mucous secretion poured out by the vast number of mucous glands in the nose, and consequently, the discharge is only mucopurulent, whereas in the accessory sinuses the mucous secretion is scanty and the leukocytes at least equally numerous, so that the discharge is more definitely purulent. With regard to metaplasia of the epithelium, small areas were found in three of the nine antral cases (33 per cent.), in which the superficial cells approximated more closely to the squamous than to the cylindrical type. Oppikofer found this condition present in 41 per cent. of antral cases. The question of the relationship of cholesteatoma of the accessory sinuses and middle ear to this metaplasia of the epithelium is not yet settled; so far, a case of cholesteatoma has not been recorded in which there was no possibility of the epithelium coming in from a surface covered by squamous epithelium (mouth, skin, external auditory meatus), but cases have been described in which this metaplasia of the epithelium was regarded as the cause of the cholesteatoma formation. In none of Fraser's specimens did the loss of superficial tissue extend deeper than the basement membrane, so that nothing in the nature of ulceration was met with in the accessory sinuses. Goetjes states that it is not possible to distinguish acute from chronic inflammatory processes by the epithelial changes.

The basement membrane, which is extremely delicate, and may apparently be absent in the normal accessory sinuses, is, as a rule, markedly thickened in cases of chronic suppuration.

The thickness of the mucous membrane varies considerably in different parts, being greatest in the hollows and least over the convex surfaces; this variation depends on the amount of submucous tissue. In chronic inflammatory conditions this tissue is usually much increased in depth, the increase being mainly due to edematous infiltration, though fibrous changes, vascular engorgement, and small-cell infiltration, no doubt, play a part. Goetjes looks on sclerosis of the submucous tissue as an indication that cure had resulted in a case of chronic inflammation. Fraser agrees with Oppikofer that the degree of thickening of the submucous tissue is not a measure of the severity of the suppurative process, and that a slightly thickened mucous membrane may suppurate freely and cause the same symptoms as a sinus with enormously thickened polypoid mucosa. In fact, many cases of this latter type are not clinically, or pathologically, severe, and are more allied to conditions of simple nasal catarrh and polypus formation.

The edematous infiltration results in a widening of the delicate connective-tissue network, so that large spaces are formed which are filled with serum; the process is, in fact, exactly similar to that found in the middle turbinal in so-called "chronic hypertrophic rhinitis." This polypoid character shows itself especially in the dependent parts of the sinuses, *e. g.*, along the floor of the maxillary antrum; the condition is not difficult to explain, for we have only to remember that the mucous membrane accurately fitted the antrum when the submucous tissue was of normal thickness; after it has increased tenfold in depth it follows that if the epithelium on the surface is to remain of the same superficial area it must become folded on itself, or, in other words, polypoid.

The small-cell infiltration varies markedly in situation, in degree, and in the character of the cells; in some cases there is marked edema and marked small-cell infiltration. Again, the infiltration may be confined to that part of the submucous layer which lies just under the basement membrane, or it may be more or less evenly distributed over the whole thickness of this tissue, or it may be in places aggregated into lymph nodules. It has not been observed by Fraser to be especially marked in the deepest layer of the submucosa, but such appearances have been reported by Oppikofer. In some cases, the submucosa resembles embryonic connective tissue. The great majority of the cells are lymphocytes; this is interesting, because cytological examination of the fluid washed out of the maxillary antrum and nose by puncture through the outer wall of the inferior meatus frequently shows the cellular elements to consist almost entirely of polymorphonuclear cells. This discrepancy is not explained, but it is deemed important in these cases to use a stout hollow needle which can be fitted on to

the barrel of an evacuating syringe, so that any discharge present in the antrum may be withdrawn into the syringe and examined without the risk of contamination by the mucopus and microorganisms present in the nose.

The gland ducts in the submucous tissue may be dilated and filled with mucus, degenerated cells, and leukocytes; in one case, marked fibrous thickening around the ducts was observed. Cysts are occasionally found in the submucous tissue; these are filled with homogeneous "colloid" material and lined by cubical cells; they are, of course, due to blockage of the gland ducts, and are said to be more frequent in the antrum than in the frontal sinus; they are not diagnostic of chronic suppuration, according to Oppikofer. Goetjes frequently observed cysts in the sphenoidal sinus mucosa.

The great engorgement characteristic of acute inflammation is not present in chronic cases to the same extent, but still a certain amount of vascular dilatation is to be observed. Thickening of the vessel walls was observed in one of the cases, and Oppikofer has described hyaline changes in the walls in otherwise healthy (presumably non-syphilitic) people. One such case has been observed by Fraser. The small-cell infiltration is usually very marked round the vessels. Old hemorrhages are not infrequently seen in the submucous tissue, and deposits of pigment are also found.

In the cases of antral, sphenoidal, and frontal suppuration the bony wall of the sinus was not included in the tissue examined, but out of the eight ethmoidal cases osteoclasts were found in only one instance. Bone disease may be present in accessory sinus suppuration, but it is not an essential change, and is due to the more or less gradual spread of the inflammatory process from the surface through the mucous membrane. Grunwald found bone disease in 18 per cent. of antral cases and in 60 per cent. of ethmoidal cases, and Oppikofer states that the bone often appears to be eroded with numerous lacunæ-like depressions, that lamellar formation is irregular, and bone cells are enlarged. He states that osteoclasts are very rare; Fraser has observed them in one case of ethmoidal suppuration.

Microorganisms were not found in the tissues in a single one of the cases mentioned, although numerous sections of all the cases were examined after staining by Gram's method in addition to the ordinary stains. In the discharge lying on the surface organisms could occasionally be seen. Wade found organisms present in four antral cases, and in three of these the bacteria were present in the cells of the mucous membrane, while in one case there were small abscess cavities crowded with cocci in the submucous tissue. Lack expresses the view that there is no definite evidence at present to show that a particular organism or mixture of organisms is associated with a definite sort or degree of inflammation.

Fraser claims that in nasal polypus formation and in inferior turbinal hypertrophy the condition is essentially one of chronic inflammatory edema or serous exudation into the connective-tissue spaces under the basement membrane; the amount of leukocyte infiltration is slight, while the superficial epithelium is, as a rule, practically normal. On the other hand, from the microscopic examination of the nasal mucosa in cases of ozena it is apparent that the change in the superficial epithelium is very marked—large tracts are converted into squamous epithelium and keratinization of the superficial cells is sometimes present; the glands are atrophied and there is intense leukocytic infiltration of the submucous tissue; edema, on the other hand, is absent. Not infrequently, however, the inferior turbinal shows typical atrophic changes, while the middle turbinal shows a polypoid condition.

In the accessory sinuses similar changes may be met with; thus, two of the cases showed edema of the submucous tissue with intact epithelium and little or no leukocyte infiltration. Kahn also remarks on the similarity of one of his cases to nasal polypus formation. On the other hand, many sinus cases that come to the radical operation show changes which closely correspond to such conditions as suppurative rhinitis or ozena. In these cases we have dense leukocytic infiltration with marked changes in the superficial epithelium (loss of ciliated layer, etc.). It is, of course, obvious that the accessory cavities are not, like the nose, subject to the drying influence of the air currents and are not so liable to mixed infection; consequently we do not meet with the foul-smelling dry crusts in the accessory sinuses.

Catarrh of the mucous membrane of the accessory sinuses is much more common than is usually supposed. Oppikofer found that about half of his ninety-four postmortem cases of sinus inflammation might be classified as catarrh and half as suppuration. All rhinologists are well acquainted with the type of patient who comes complaining of nasal discharge and obstruction, with perhaps a heavy feeling over the bridge of the nose or glabellar region. On examination the turbinals are found to be enlarged—the middle turbinal polypoid—and there is excess of mucopus in the nose. The antra fail to illuminate, though the frontal sinuses, as a rule, light up well. On puncture of the antra only a little mucus or flaky mucopus is washed out. The number of cases which fail to illuminate is too large to be accounted for by anatomical causes, such as thick bony walls. It is not to be concluded that accessory sinus catarrh is present in all cases of nasal catarrh, or that nasal suppuration is to be found in all cases of sinus suppuration. The position of the ostia of the accessory sinuses, while it renders infection of the mucosa of the sinus difficult, also tends to prevent the spontaneous cure of a severe sinus infection. The nasal mucosa, on the other hand, is frequently affected by catarrhal processes, but the drainage conditions in the nose are much more efficient than those

in the accessory sinuses. In short, the nasal mucosa, though frequently infected, has a great chance of recovery, while the accessory sinuses, though not so exposed to catarrhal or suppurative processes, are less able to throw off these conditions once they have occurred.

Finally, Fraser suggests that in the classification of acute and chronic simple inflammatory processes in the upper respiratory tract it would be well to consider the changes not only in the submucous tissue, as Eschweiler has proposed, but also in the epithelial covering.

Under the heading of simple catarrh might be included cases with edema of the submucosa, with slight alteration of the superficial epithelium, and only moderate leukocyte infiltration of the submucous tissue. Under the heading of suppurative catarrh we might include four more or less distinct conditions: (1) Cases with little or no edema and only slight epithelial changes, but with marked leukocytic infiltration. (2) Cases similar to the above, except that the epithelium has undergone metamorphosis, or is almost entirely absent over large areas. (3) Cases with marked edema and leukocytic infiltration, but with slight epithelial changes. (4) Cases with marked edema and leukocytic infiltration, but with extensive changes in the epithelial layer.

Treatment of Suppuration of the Accessory Sinuses. Hajek¹ lays great stress upon the importance of general treatment in acute conditions of the accessory sinuses. In all cases of sinusitis depending upon acute colds or influenza he obtains speedy cures by means of sweating through the use of aspirin in fifteen to thirty grain doses. This is continued for three or four nights in connection with dry friction of the entire body twice a day. He also considers a change of climate of great value in effecting a speedy cure. The particular climate does not seem of as much importance as a change from the climate in which the disease developed.

In the treatment of chronic cases of frontal sinusitis, Hajek obtains favorable results in many instances by intranasal measures. He practises resection of the middle turbinate, removing it at its extreme anterior portion from the agger nasi with curved scissors, in this way laying open the infundibulum. Where this does not succeed in effecting a cure in a reasonable time, which means in some cases months or even years, he practises the external opening according to the Killian method. He does not favor the primary closure of the external wound, regarding it as the cause of the frequent failures in this operation. He condemns the osteoplastic operation because of the many cases of recurrence.

Diseases of the ethmoidal cells demand exenteration intranasally. Only in cases where the extreme anterior cells are involved is an external operation necessary. He urges the importance of careful cocainization

¹ Archives Internat. de Laryngol., d'Otol., et de Rhinol., January-February, 1909.

of the operative field before beginning the operation, removing only such portions of the disease at a single sitting as the patient can endure and the application after the final operation to the granulations which spring up of 3 to 10 per cent. nitrate of silver.

In the treatment of sphenoidal sinusitis, he does not attach much importance to lavage nor to enlarging of the ostium, because of its tendency to close. He believes, that the greatest relief will be had by the thorough removal of the middle turbinate and ethmoid and the anterior wall. To accomplish this, he employs either his hook or one of the various models of cutting forceps or the electric trephine.

Indications for Intranasal Operation in Sinus Suppuration. In discussing the processes which call for intranasal treatment, Hanau W. Loeb¹ expresses the opinion that the great majority of cases of suppuration of the accessory sinuses of the nose are amenable to intranasal treatment at some period in the course of the disease. Suppuration of the ethmoid labyrinth responds most readily to this form of treatment, with that of the maxillary, sphenoid, and frontal, following in the order mentioned. Intranasal treatment may be of no avail in suppuration of any of these cavities, however, if the process has been long-continued, or if the infection is rapid and virulent.

Loeb finds that an intranasal operation ordinarily suffices for the relief of simple, uncomplicated suppuration of the maxillary sinus, provided there is no dental cause. Even then relief may follow the intranasal operation if there is no active process going on in the tooth or alveolus. Furthermore, good results may be obtained by combining with the nasal operation the removal of diseased roots of teeth.

While a simple puncture through the naso-antral wall is often sufficient, as a rule, the best results are obtained only when an extensive resection of this wall is made. This requires the removal of a portion of the inferior turbinate, in this way affording ample space for irrigation and drainage. The well-known tendency of all these openings to contract, and in many instances to close altogether, further calls for a large opening, which would, at least, do no harm. The position of election for opening this sinus is just below the attachment of the middle portion of the inferior turbinate. This enters the sinus in every instance, and in the main at its most dependent part.

In some acute cases of frontal sinusitis, even when associated with ethmoiditis, operation through the nose will afford sufficient drainage and thereby result in cure. Even in the more chronic cases relief follows resection of the adjacent ethmoid cells and irrigation through the nasofrontal canal with or without enlargement. Although claims are made that well-marked cases of frontal sinus suppuration may be relieved by the various intranasal methods, Loeb thinks that ordinarily

¹ Journal of the American Medical Association, September 25, 1909.

nothing short of an external radical operation suffices. Owing to the inaccessibility of the frontal sinus to nasal operative procedures and the anatomical variations in the sinus, the nasal operation is uncertain, difficult, or impossible. He thinks that in almost half of the cases there must be some doubt as to whether the frontal sinus is being treated when intranasal operative measures are directed toward relief of frontal sinus suppuration. It must be admitted, however, that a careful study of properly taken radiographs will reduce this possibility of error considerably, but this involves lateral as well as anterior views, perhaps with the probe *in situ*. The intranasal operation has, therefore, a limited field of service, and is subject to much likelihood of error. There is, however, this saving clause—that, even if the operation is directed toward an adjacent cell, so much bone and other tissues will be removed that drainage from the frontal is promoted and the condition is relieved. Good results should not be anticipated in those cases in which the frontal extends over the orbit and is affected in this portion.

Ethmoid suppuration, when uncomplicated, practically always responds to intranasal treatment, for the entire ethmoid labyrinth may be exenterated by operation through the nose. Sometimes the most anterior cells cannot be freely opened and curetted on account of their proximity to the nasal bone. Hajek asserts, however, that it can always be done if the middle turbinate has been properly resected. There are occasionally anomalies of development of the ethmoid cells, which render the operation either difficult or unavailing.

In uncomplicated cases of sphenoid sinus suppuration, and those in which the ethmoid alone is involved with the sphenoid, the nasal route is the only one to be advocated. There is a growing disposition, even among those who formerly thought that the external operation was always to be advised, to rely more on the intranasal method. The nasal operation can be of service only by the curettement and the improved drainage occasioned by the enlargement of the nasal opening.

Indications for External Operation in Sinus Disease. Coakley¹ says that in all but the very acute cases complicated by cellulitis, when an immediate external operation is indicated, before deciding on recommending to the patient the intranasal or external operative route, a complete examination should be made. This includes: (1) The determination of the number of sinuses involved. (2) Having a skiagraph made which, if good, will show the size and shape of the frontals and the number of septa within them, the width of the ethmoidal area, and the approximate size of the sphenoids. (3) The general condition of the patient. In chronic sinus disease, the presence of marked disease of the arteries, heart, lungs, or kidneys, makes the external operation far more serious and frequently undesirable. (4) Determine, if possible,

¹ Journal of the American Medical Association, September 25, 1909.

whether the disease is acute or chronic. In very few acute cases, not complicated by the external manifestations described later, does the condition require an external operation. (5) If acute, decide whether the history points to a simple acute inflammation of a previously healthy sinus or to an acute exacerbation of a chronically diseased sinus. In the latter case it is wiser to defer the external operation until the acute symptoms have subsided. (6) The severity of the symptoms, more especially of headache and its effect on the patient. Some patients suffer so much more than others from sinus disease. There is nothing in either the character or amount of the discharge to account for this, nor even in the size of the sinuses as shown by skiagraph. As a rule, those with very large sinuses suffer more than those with small sinuses, but there are many exceptions to this rule. If intranasal operations fail to give the desired relief, then an external operation is indicated. (7) The ultimate result of the treatment of chronic sinus disease should be carefully explained to the patient by his physician. Intranasal methods relieve and may cure. The cavities remain and may again become infected. External operations remove all the diseased membrane, obliterate the cavities, and result in a permanent cure. There is a scar and frequently some deformity in a portion of the anatomy where it is easily seen by the patient, and this fact alone often deters some individuals from submitting to the external operation. (8) As intranasal treatment necessitates frequent operations at short intervals, many who can ill spare the time for such treatment prefer the more thorough and less time-consuming external operation. (9) The neurasthenic patient who is prostrated each time any intranasal operation is attempted, and rarely submits to enough being done to make much headway against the disease, should be urgently advised to submit to the external operation. (10) Very narrow nasal chambers add greatly to the difficulty of intranasal operations, and to such patients with chronic suppuration of the frontal, ethmoid, and sphenoid we recommend the external operation.

In considering the diseased conditions in the various sinuses requiring external operation, Coakley divides them into an acute and chronic type.

Acute Frontal, Ethmoid, and Sphenoid Involvement. Whenever acute involvement of these sinuses is accompanied by marked edema of the skin of the forehead, eyelids, or side of the nose, exophthalmos, orbital cellulitis, local heat, great local tenderness, with or without a rise in the body temperature, an external operation is imperative and should be done without delay, for fear of supervening meningeal or other intracranial complications. On the other hand, it must not be considered that we would invariably advocate external operation for the relief of very slight local edema and swelling without first attempting by intranasal treatment to relieve the condition. It is possible

that deflections of the septum, or large bony exostoses, might render it impossible to give adequate intranasal treatment, in which case external surgery must be resorted to. The proportion of acute cases demanding external operation is few as compared to those which can be cured by intranasal treatment.

Acute Maxillary Sinusitis. Very rarely one meets with an osteomyelitis of the superior maxilla associated with acute maxillary sinusitis. Such cases should be treated by a larger opening and drainage through the gingivobuccal fold. All other cases of acute disease of this sinus may be satisfactorily treated intranasally.

Chronic Suppuration of the Frontal, Ethmoid, and Sphenoid. (a) Those associated with multiple polyp formation in the nose. Most of these cases are accompanied by such extensive alterations in the mucous membrane lining the frontal, ethmoid, and sphenoid, that intranasal treatment, while affording great relief, seldom affects a permanent cure. The polyps recur more or less rapidly in a large percentage of cases. An external operation may be relied on to cure.

(b) Frontal sinuses which are demonstrated by the skiagraph to be of large size, with one or more septa and extensive prolongations over the roof of the orbit, can seldom be so drained by intranasal operations as to prevent the recurrence of the symptoms with each succeeding attack of severe acute rhinitis. If the patient's general condition, therefore, will warrant it, an external operation for this class of cases is preferable to repeated intranasal treatments.

(c) Closed empyemata of the frontal, as evidenced by recurring attacks of supra-orbital pain without the history of any secretion from the nose or nasopharynx or occasional scanty secretion, which the examining physician fails to detect, and in which the skiagraph shows an evident involvement of the frontal, are best treated by an external operation.

(d) Cysts of the frontal and cysts of the ethmoid region which do not bulge into the nasal cavity are proper cases for external operation. In this class of cases the anatomic structures are considerably altered, and absorption of the bony wall of the cranium not infrequently has been observed. Any attempt to evacuate the cysts through the nose is too much a matter of guess work to be called good surgery.

(e) Those in whom a fistula has formed leading from the frontal or ethmoid, are advised to have an external operation. The question of scar does not affect these patients, as they already suffer a disfigurement which may be considerably improved after the operation.

Chronic Maxillary Sinusitis. Very few cases of chronic suppuration of the antrum need anything more than a thorough opening through the inferior meatus to effect a cure. If these patients do not recover promptly, a search is made for involvement of the ethmoidal cells or frontal sinus, and by curing the disease in this region the antrum

promptly ceases to discharge. If there is a tendency to recurrence of the disease two or three times a year, as a result of attacks of acute rhinitis, then a thorough opening of the antrum through the canine fossa is recommended.

Complications of Sinus Disease. Logan Turner¹ says that we have to consider whether the onset of orbital complications should be made an indication for opening the affected frontal and ethmoidal sinuses by an external operation. Notwithstanding the fact that a number of cases have been recorded in which inflammatory edema of the eyelids complicating an acute inflammation of these sinuses have been completely cured by endonasal treatment, he is of the opinion that the external operation is the wiser procedure. It is often impossible to say whether the orbital swelling is merely due to edema, or whether pus has already formed within the cavity of the orbit. Early evacuation of an abscess in this situation is essential, not only for the preservation of the function of the eye, but in order to prevent the risk of secondary intracranial complications.

In cases of chronic sinus suppuration, in which an abscess forms in the orbit, there is in all probability caries and destruction of a part of the bony wall of the sinus contiguous with the orbit; consequently an external operation is the only possible procedure. The incision should be made immediately below the eyebrow, and great care should be taken to detach the periosteum from the inner and upper wall of the orbit without injuring it and exposing the orbital fat. As a rule, the pus is found between the periosteum and the bone. The ethmoidal cells can then be freely opened by the removal of the lamina papyracea, and the frontal sinus can be explored by removal of the inner portion of the roof of the orbit which forms the floor of the sinus. The sinuses may then be dealt with according to the condition and size of the cavity. In the ethmoidal cells it will probably suffice to establish a large communication with the nasal cavity, while the orbital wound is lightly packed, the skin incision being left unsutured for a few days. The nasal drainage is assisted by the removal of the middle turbinated bone.

In cases of chronic frontal sinus suppuration the cavity of the sinus should be obliterated by the removal of its anterior and inferior walls, preferably by the method described by Killian. An operation which is confined to an orbital incision must be condemned as imperfect, as it only leads to the establishment of a fistulous opening.

Endothelioma Myxomatodes of the Antrum. This rare and interesting condition, both from a clinical and pathological standpoint, is described by Herbert Tilley.² The patient complained of stuffiness of the left nostril, with a slight mucopurulent discharge and severe colds in the

¹ Edinburgh Medical Journal, May, 1909.

² Lancet, London, July 17, 1909.

head. These symptoms had been especially noticeable during the past four months, although the patient had suffered from severe headache for several years. The pain affected the whole left side of the head, was particularly severe in the left eye, and became worse at night, often preventing sleep. During a severe attack the sight of the left eye would become affected with a sort of mistiness, and the patient was unable to see more than half of an object.

On examination, the left antrum was dark on transillumination, but neither in the canine fossa, over the left side of the hard palate, nor within the nasal cavity were there any very definite signs of distention of the antral cavity. Only in the left middle meatus and corresponding to the upper membranous portion of the inner antral wall was there noticed a distinct fulness, which offered slight resistance to the probe and gave much the same impression as would be derived from probing soft beeswax. This region was pierced and a small curette inserted, a very thick, reddish-brown, gummy substance being withdrawn. There were no polypi in the left nasal fossa, and beyond slight congestion in the middle meatus and the fulness of its outer wall these regions presented no abnormality. The inner antral wall was now punctured by passing a trocar and cannula upward, outward, and backward on the outer aspect of the inferior turbinated bone. On injecting warm boric acid solution a sense of resistance was felt, no fluid returned through the nostril, and the patient experienced a sense of fulness in the cheek bone, and the second upper left bicuspid, which was filled with amalgam, commenced to ache.

Some unusual condition of the antrum being suspected, chloroform was administered, the left posterior naris plugged with a small captive sponge, the anterior two-thirds of the inferior turbinate removed, and the canine fossa fully exposed through an incision in the gingivolabial fold extending from the malar ridge to the canine root. The antrum was now opened through the canine fossa, a hole the size of a sixpence being made. The sinus was seen to be fully occupied by a growth the surface of which was bluish gray in color. There was no hemorrhage from its surface, nor was there any purulent or mucopurulent discharge in the antrum. The growth, which consisted of a semisolid, reddish-brown, gummy substance, was readily shelled out and the lining of the antrum showed little alteration from its normal condition. A slight oozing of blood occurred, but it was impossible to determine the point of origin of the growth. The inner antral wall and the anterior ethmoidal cells were next removed through the opening in the canine fossa, the parts cleansed, and the bucco-antral wound sutured. The patient left the hospital in one week, and has been greatly relieved since the operation; the stuffiness has entirely disappeared, and only one slight headache has been experienced.

Sections of the growth displayed groups of cells parted by an abundant

mucinoid stroma and often taking the form of long, slightly tortuous columna. The cells composing the groups were closely packed, and their nuclei of very diverse forms, distorted and flattened, as though pressed out of shape by the swelling of the intervening stroma. There were no polymorphonuclear leukocytes or lymphocytes among or around them. The cytoplasm was distinctly visible in isolated cells, and in the carbolthionine preparations stained slightly differently from the stroma. The cells were quite distinct from the other substance and took no part in its formation.

The general irregularity of form and the grouping of the cells, together with the manner in which the groups became attenuated and lost in the stroma (single, isolated cells of the same kind occurring in sparse number in the latter), recall the histological picture of certain types of endothelioma. There was nowhere any lumen to the groups. None of the "cancer bodies" present in carcinomata were found in any of the cells. Sections stained with Scharlach showed that not a few of the cells contained moderate numbers of minute droplets of fat.

The stroma was everywhere in excessive bulk, and was either homogeneous or presented marks of fibrillation, with very few or no pertaining corpuscles. The substance in question had arisen from mucinoid degeneration, swelling and coalescence of the connective tissue fibers of a stroma between the cell groups; even where the fibrillation was most pronounced the individual fibers wanted the normal aspect and took an abnormal stain. In preparations treated with hematoxylin the material was of different shades of violet, and so differed from normal fiber, which remains uncolored. In carbolthionine preparations the material stained a pale violet and pink, the two merging one into the other; here and there it was traversed by a certain number of long, twisted, ribbon-like processes of a bright-red color, which, from the way in which they followed all the windings of the circumjacent substance, were evidently of the same kind, although the difference in coloration marks some slight difference in chemical composition.

A noteworthy feature in the degenerative stroma was the presence of long, coarse crystals, tapering at the ends, and occurring singly or in bundles. In carbolthionine preparations these were stained a pale sky blue; in hematoxylin and eosin preparations they were pale orange, while in hematoxylin alone they were uncolored. That they were not due to the action of the reagents used was evident from the fact that in the material examined in the recent state the same crystals were present. In the sections, the crystals, when cut transversely, were regularly hexagonal, and this was equally true of those that were isolated and not subject to the lateral pressure due to their grouping. The nature of these crystals is unknown, but they appear to be in some way connected with the degenerative process.

The growth may be classified as an endothelioma of which the stroma

has undergone mucinoid degeneration. An analagous condition is met with, though rarely, in carcinoma, and has been termed "carcinoma myxomatodes," and the same adjective may be employed to cover the condition present in this tumor.

THE PHARYNX.

Pharyngoscopy. In making an examination of the nasopharynx by means of the rhinoscopic mirror, difficulties are frequently encountered on account of sensitiveness or narrowness of the oropharynx, and in some cases it is quite impossible to obtain a satisfactory view of the parts. Harold Hays¹ claims to eliminate these difficulties by the use of the pharyngoscope which he has devised.

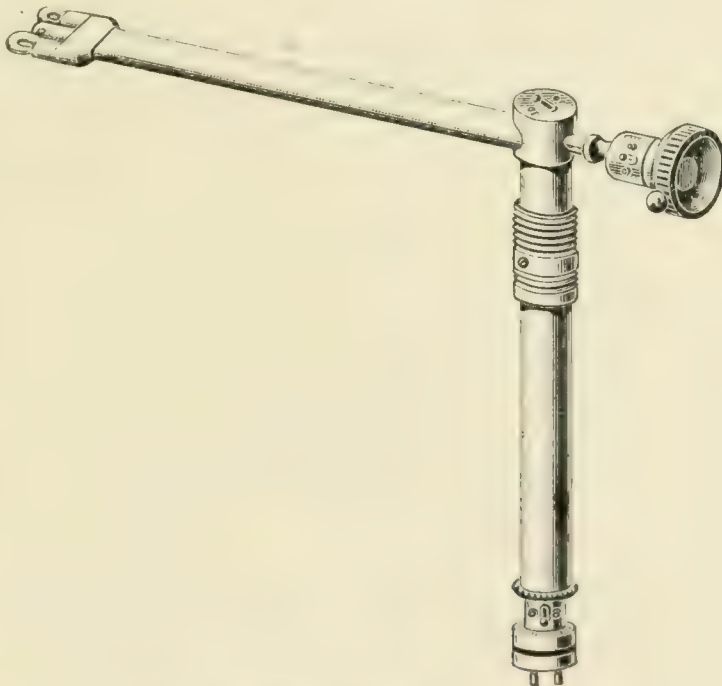


FIG. 5.—The Hays pharyngoscope.

The pharyngoscope is composed of a horizontal and a vertical shaft which join each other at right angles, at the outer third, so that the instrument may be used as a tongue depressor. The inner portion of the horizontal shaft consists of a central circular tube with an electric light carrier on either side, the three components being incorporated in a flat piece of metal. From the inner end project the two electric lights, which are water tight, give an intense illumination, and become only warm enough to keep vapor off the lens. In the central tube is inserted the telescope, which is made on the principle of the Otis cysto-

¹ Laryngoscope, July, 1909; and New York Medical Journal, August 21, 1909.

scope. To the eyepiece is attached a little metal ball which indicates the position of the lens. This horizontal shaft, including the telescope, is about eight inches long. The widest portion of the instrument, which is at the extreme inner end, is less than five-eighths of an inch, and the flat metal shaft itself measures less than one-half inch in diameter. The vertical portion is about six inches long and one-half inch wide. It is attached to the horizontal portion by a screw joint, and contains the wires for connection with the rheostat or dry cells. Near its upper portion is an arrangement for cutting off the electric current so that the lamps need not be turned on until the instrument is in the mouth.

On account of the cement which holds the lens in place, the instrument cannot be boiled, but, like the cystoscope, it is best disinfected by formalin. For that purpose a metal box is supplied with the instrument which is large enough to contain the horizontal shaft (except the eye piece), and has a receptacle at one end for formalin tablets and cotton. For ordinary purposes the instrument is cleaned with lysol, 5 per cent. carbolic acid, and alcohol.

The instrument is inserted into the mouth like a tongue depressor until the inner end of the telescope is about one-sixteenth of an inch from the pharyngeal wall. When once in place it is held firmly by the examiner, and the patient is told to close his mouth and to breathe quietly through the nose. As soon as the mouth is closed, it is observed that the muscles are relaxed and that the nasopharyngeal space is much enlarged. An excellent view of the parts to be seen can be obtained by gazing through the eye piece of the instrument. In order to keep the patient from breathing in the examiner's face a small mica plate is supplied, which is placed between the telescope and the horizontal shaft.

Pneumococcus Invasion of Throat. Sir Felix Semon¹ adds one case of pneumococcus invasion of the throat to the two cases thus far recorded. The case terminated fatally, owing to tuberculosis supervening on the original infection. The patient complained of unpleasant sensations in the throat, which were referred to the region of the lingual tonsil. The lingual tonsil was found to be distinctly swollen, and was treated with applications of a solution of iodine and potassium iodide (Lugol's solution). After a few applications the swelling decreased, and the patient for a few days felt better. He returned, complaining of distinct pain in the left side of his throat. An irregular superficial small ulcer, surrounded by a small area of whitish discoloration, was seen in the lateral wall of the throat, just opposite the last molar, and in its neighborhood a few small irregular spots of white infiltration, but without loss of substance, were visible. The ulcer was not bigger

¹ British Medical Journal, June 26, 1909.

than a split pea. It was cauterized with a weak solution of chromic acid and, as this proved of no avail, with a solution of nitrate of silver (60 grains to the ounce).

For a time these applications afforded relief; usually, however, within a few days after disappearance of the ulcer it reappeared, sometimes with, sometimes without, a whitish infiltration in its neighborhood. No enlargement of the cervical glands was ever present. A scraping from the ulcer showed an almost pure culture of pneumococcus. Despite local applications, curettage, and vaccine injections, the patient's condition rapidly became worse. Multiple ulcers made their appearance, together with edema of the larynx, pulmonary consolidation, and extreme emaciation. The patient died about seven months after the onset of his trouble.

Chronic Epipharyngeal Periadenitis in Adults. Under this heading James E. Logan¹ describes a condition which he has found in a number of cases, six of which are given in detail. It is an inflammation of the tissue in the neighborhood of the pharyngeal bursa which may occasion symptoms analogous to those of sphenoid sinus inflammation. The inflammation seems to involve not only the lymphoid tissue, but also the muscles, vessels, and connective tissue. The microscopic findings in these cases are given in full.

The effect of such inflammations on the organs of hearing is evident. If repeated attacks occur, the patients are left especially liable to attacks of acute rhinitis and epidemic influenza. While this lymphoid tissue atrophies as age advances, a very little of it may be sufficient to cause trouble. The diagnosis of the condition is not difficult. The prognosis is usually favorable, in so far as the vault is concerned. The symptoms are those of repeated attacks of influenza, a sensation of fulness in the vault of the pharynx, desire to hawk and expectorate, etc. The treatment consists in total extirpation of the diseased tissue.

Logan gives a full description of his method of operating. He says that a digital examination should always supplement that made by the mirror. In order to avoid hemorrhage he advises the preliminary stripping of the mass from its attachment, to break up the continuity of the bloodvessels, and its removal with instruments two days later. The greatest abundance of the mass is generally found in the fossa of Rosenmüller.

New Operation for Palatopharyngeal Adhesions. Roe² reports a case in which the fauces were so extensively lacerated during an attempt to excise the tonsils, about four months previously, that when healing had taken place there was a complete adhesion between the soft palate and the pharynx. The occlusion of the posterior nares was complete,

¹ Transactions of the American Laryngological Association, 1909, p. 300.

² New York State Journal of Medicine, July, 1909.

with the exception of a very small opening, through which an ordinary small silver probe could be passed. The adhesion was so thick and the tissues so infiltrated with inflammatory deposits, the result of the extensive inflammation that followed the operation, that the obtaining of a healed opening at each side through this thickened tissue proved to be practically out of the question.

As it was necessary to cover but one surface of this opening, the upper or palatal side was most available. A rather broad flap was taken from the inside of the cheek near the lower jaw, including sufficient submucous connective tissue to assure the vitality of the flap. This was then brought down and the end turned backward and upward around the lower border of the soft palate, which had been sufficiently denuded of its mucous membrane around its lower border to secure union. This flap was then stitched at the sides and also through and through along the upper border of the end of the flap that had been turned up behind the palate.

Complete union of the flap took place, and on healing there was no undue contraction at the site of these flaps, nor was there the slightest inclination to re-adherence of the soft palate to the pharynx at any point. The surfaces from which the flaps had been taken were speedily covered with mucous membrane, and soon all traces of it disappeared. The central portion of the palate was thickened, and this thickened tissue was utilized by cutting and stitching it into shape so as to form a very desirable uvula. As the levator palati muscles had not been sufficiently injured to destroy their function, by the construction of this new uvula the function of the soft palate in closing the posterior nares during deglutition and phonation was almost completely restored.

Primary Tuberculosis of the Nasopharynx. Primary tuberculosis of the nasopharynx is decidedly rare, but very few cases having been reported. Merkel¹ was able to find only four cases recorded in which the primary lesion of the nasopharynx was confirmed by autopsy. He reports a fifth case which came under his observation, which without the postmortem findings would have been regarded as an unquestionable case of pulmonary tuberculosis with a secondary tuberculous meningitis. Tubercle bacilli were constantly present in the sputum, but the focus in the nasopharynx was the only manifestation of tuberculosis discovered in the cadaver. There had been no evidence of the nasopharyngeal lesion except the bacilli, which were ascribed to the lungs.

This case emphasizes the importance of having a careful and repeated examination of the upper respiratory tract in all patients suffering from pulmonary tuberculosis.

Throat Symptoms in Syringomyelia. Baumgarten² reports a case of paralysis in the throat and palate, with sensibility and reflexes normal,

¹ Münchener med. Wochenschrift, June 8, 1909.

² Berliner klin. Wochenschrift, August 23, 1909.

in which further investigation revealed syringomyelia. There had been no other noticeable disturbances beyond the change in the voice, but the paralysis of the palate and atrophy of the right side of the tongue confirmed the diagnosis of syringomyelia. He cites 26 similar cases from the literature, and points out that the symptoms in the throat may be the first signs of the affection. In 9 of the 27 cases there was atrophy of the tongue, and there was paresis of the palate in 17. In 3 cases the hoarseness came on suddenly.

The Faucial Tonsils and the Teeth. George H. Wright,¹ in discussing the functional relation of the tonsil to the teeth, states that when a tonsil is normal, infection from the external surface is rare. Secondary infection through the lymph channels is the usual source. There are four periods of molar eruptions, with some variations in time when the tonsils may enlarge without infection or inflammation, at two years, six years, twelve years, and seventeen years. Tonsils, though slightly enlarged, when not infected return to normal with complete eruption of the teeth. Diseased teeth are a prolific source of enlargement of the glands through proximity of membranes, either directly, by infection, or by toxins. In the treatment of the tonsil by the specialist should be included as a routine the observation as to carious teeth and a recognition of these four periods of eruption coincident with slight enlargement.

G. Hudson Makuen² emphasizes the importance of the faucial tonsils from the standpoint of the dentist. Diseased faucial tonsils affect the teeth in three ways: (1) By impairing the general nutrition; (2) by contributing very largely to the local invasion of the teeth by the numerous bacteria that infest their crypts, and (3) by their pressure they interfere with the alignment of the teeth and with the normal development of the maxillary bones. That diseased tonsils affect the general health has been proved beyond the shadow of a doubt, and the teeth suffer with it, as well as directly, by contact with its filthy catarrhal secretion. The third manner in which the teeth are affected by hypertrophied tonsils has, so far as Makuen is aware, not been mentioned in the literature, but he considers it of no little importance. These glands are sometimes very large and dense, and their constant pressure on the surrounding structures may cause changes that will seriously embarrass the normal circulation and respiration, produce neuralgias, etc., as well as interfere with the normal development and arrangement of the teeth. The indirect effect of diseased and hypertrophied tonsils on the teeth and their settings through forced mouth breathing has been described fully by numerous observers.

Makuen pleads, therefore, for the eradication of all glandular obstructions to the normal development of the teeth and alveolar arches prior

¹ Boston Medical and Surgical Journal, May 20, 1909.

² Journal of the American Medical Association, June, 19, 1909.

to any attempt to remedy the structural defects of these organs. He thus sums up his conclusions: The faucial tonsils and the teeth are in close approximation, and they are alike subject to disease or degeneration. Diseased tonsils and teeth are locally and systemically unhygienic. Secretions from the tonsils may infect the teeth, and, contrariwise, the tonsils may be infected by the teeth. Diseased tonsils and teeth cause headache, earache, and facial neuralgia, and they become a direct source of infection to the glands of the neck and, through the efferent lymphatics, to the general respiratory and circulatory systems. Hypertrophied faucial tonsils often become so large as to affect the ear, the circulation of blood, the nerve supply of the face and head, and the normal development of the alveolar arches. The teeth serve important purposes, but the exact function of the tonsil has not yet been demonstrated. The importance of preserving the teeth has been fully recognized, but the diseased tonsil is not worth preserving, for it has lost its usefulness and becomes a menace to the human economy. The only rational remedy for diseased tonsils is total extirpation.

Tonsillar Enlargement and Opoththerapy. In a paper before the Parisian Society of Laryngology, Otology, and Rhinology, Jules Glover¹ says, besides infectious phenomena, one observes vasomotor and secretory troubles in the region of the faucial and pharyngeal tonsils. Moreover, we frequently see a shrinking of the faucial tonsils after the removal of the pharyngeal, even to such a degree as to be able to dispense with all intervention on them. If one takes one's stand on the functional coördination of glands with internal secretion, one must admit in these cases, in view of the synergy between the organs, a compensatory ability, a correlation hypertrophy for the purpose of functional accommodation. Basedow's syndrome has been described in adenoid subjects and adenoid vegetations, and tonsillar hypertrophies have been considered a sign of myxedema.

If the function of certain glands with internal secretion, as the thyroid (seeing its relation with growth) and the pituitary body (seeing its relation with giantism), has a real bearing on the growth and development of the organism, there is no need for astonishment in observing increased growth and functional disturbances of glands more or less marked when tonsils and adenoids are too radically removed.

Opoththerapy has in these cases attenuated the vasotrophic troubles in a decided manner and sometimes brought about their disappearance, together with an improvement in the general condition. Results have varied with the organic juice employed. By adding phosphoric acid to the opoththerapy in sufficiently increased quantities the dose can be much reduced, enabling one to obtain the same effects, local and general, without toxicity, during a prolonged treatment. Tonsillar juice alone

¹ Archiv. Internat. de Laryngol., d'Otol., et Rhinol., 1909, vol. xxvii, p. 568.

or associated with thyroidin and pituitary has been employed in tonsillar dystrophies in the case of infants from five to fifteen years of age. By adopting these various methods of treatment a quite rapid reduction of the tonsillar hypertrophy has been induced by intervening solely on the pharyngeal tonsil, and even sometimes without any surgical treatment when there was no pressing indications to operate.

Lermoyez¹ calls attention to the fact that the first trials of opotherapeutic treatment for adenoid vegetations date back to Hertoghe, of Antwerp, who about 1898 enunciated the hypothesis that adenoid vegetations and the general troubles associated with them arose from thyroid insufficiency. He prescribed thyroid treatment for his patients, but it was practically inefficacious. Lermoyez, nevertheless, does not believe that the idea of utilizing opotherapy in these cases need be abandoned. He admits, after numerous clinical observations, that adenoids do not interfere with development by simple mechanical obstruction, but that they must give rise to secretion and absorption of a poison hindering growth, and especially affecting the nervous system. He is disposed to admit in these patients a perversion of the normal function of the adenotonsillar glands, a kind of hyperadenoidism, analogous to the hyperthyroidism in the subjects of Basedow's disease.

Tonsillectomy. Sidney Yankauer² says that if by the operation of tonsillectomy we refer to a procedure so difficult that it takes a relatively long time to complete it, so painful that it requires the use of general anesthesia, so dangerous that it must be followed by a few days' rest in bed, becoming thereby unsuitable for ambulatory cases, so severe that it is apt to be followed by marked inflammatory reaction in the contiguous tissues, then, indeed, we may well pause before urging this operation in all cases.

The question arises, Shall a tonsillotomy or a tonsillectomy be done in those cases, especially in weak or debilitated individuals, in which the indication for the removal of the tonsils is given by symptoms referable to the increased size of the organ only, namely, symptoms due to interference with respiration, deglutition, and speech? Past experience has conclusively shown that in these cases of simple hypertrophy the removal of the larger part of the hypertrophied tonsil is followed by an immediate abatement of the symptoms, although it is a fact that in these very cases of simple hypertrophy the operation of tonsillectomy is most easily and quickly performed.

When, on the other hand, the indication for the removal of the tonsils is given by the occurrence of repeated attacks of inflammation, whether of the simple, follicular, diphtheritic, or suppurative variety, by chronic inflammation resulting in a more or less extensive adhesion of the

¹ Archiv. Internat. de Laryngol., d'Otol., et Rhinol., 1909, vol. xxvii, p. 569.

² Laryngoscope, May, 1909.

tonsil to the pillars or its complete submersion under the surface of the mucous membrane, by interference of the enlarged organ with the function of the Eustachian tube, by discharge of putrescent material from the crypts into the pharynx, by absorption of rheumatic or other poisons into the general circulation, nothing less than the complete removal of all the tonsillar tissue from the tonsillar fossa can be expected to relieve the patient of all his symptoms.

In particular, the interesting question of septic absorption from the tonsils can only be decided by the observation of numerous cases in which the remote symptoms disappeared after operation. No observations which have been made in this regard in cases in which only a part of the tonsil has been clipped off with the tonsillotome are of any scientific value whatever; only those cases deserve consideration in which the complete removal of all the tonsillar tissue could be conclusively demonstrated. For this purpose it is necessary not only to remove the entire tonsil, but to remove it with its so-called capsule complete and intact; because, in the first place, it is at the bottom of the crypts that putrefaction is apt to be most frequent, and in the second place, in the numerous experiments which have been made to determine the possibility of absorption through the tonsillar tissue, the fact seems to have been generally overlooked that septic material can be absorbed from the tonsil without the necessity of passing through the tonsillar tissue at all. If a probe is passed into the crypts of a tonsil which has been removed with its capsule intact, it can be seen that many of the crypts pass directly down to the capsule itself. The probe can be clearly seen through the capsule, so that, apparently, there is no tonsillar tissue at the bottom of these crypts. The putrefying contents of the crypts are separated from the lymphatic spaces of the neck by only a thin membrane, and as there are apt to be five to six such crypts in each tonsil, the combined area through which absorption can take place is not inconsiderable.

Yankauer comments on the different methods for removing the tonsils and describes his own operation, which consists in freeing the adhesions with a blunt dissector, separating the plica triangularis with curved scissors, and removing the tonsil with its capsule by means of a cold wire snare.

DIGITAL ENUCLEATION OF THE TONSIL. A. M. MacWhinnie¹ advocates the digital enucleation of the tonsil on the following grounds: (1) Rapidity of the operation; (2) absolute non-recurrence if removed in its capsule; (3) minimum amount of hemorrhage and subsequent anemia; (4) ease of performance, so amputation should never be thought of, even as a palliative measure.

He describes the procedure as follows: The point of importance

¹ New York Medical Journal, May 29, 1909.

that should be remembered is to begin the procedure outside of the capsule, in the posterior inferior portion of the sinus, working up to the supratonsillar fossa. The finger is then brought to the posterior inferior portion of the sinus, working up to the supratonsillar fossa. The finger is then brought to the original starting point and the same procedure is carried out, posterior to the anterior pillar, into the supratonsillar fossa to meet the first dissection; the finger is then carried to the original starting point, and by working forward, the thumb being on the anterior surface of the tonsil, the enucleation is completed, the gland coming away in its capsule. At this point the operator should not try to pull the tonsil, for if he does some of the superior constrictor may come away as well and hemorrhage result. When starting the procedure, the operator should begin on the outside of the capsule; there is almost no danger of getting inside of it, for if he did it is manifest that the work would be incomplete.

H. B. Blackwell¹ also describes a method of tonsillectomy by the digital method, although he uses both knives and snare. The technique is as follows: The blunt tip of a Leland knife is introduced just behind the anterior pillar, between it and the tonsil at its inferior pole, and is brought out at the junction of the anterior with the posterior pillar above the tonsil, thus entirely liberating the tonsil from the anterior pillar with one sweep of the knife, cutting from below upward. The blunt tip of the second Leland knife is now hooked into the upper extremity of the first incision and the posterior pillar freed in much the same manner, cutting from above downward. The tip of the index finger is next introduced into the supratonsillar fossa and the tonsil gently shelled out of its bed. Only the upper two-thirds of the tonsil is shelled out, as the capsule of the inferior pole of the tonsil is extremely thin, the lymphoid tissue of this portion of the gland being more or less continuous with that of the base of the tongue and along the floor of the mouth, and any attempt to completely enucleate and remove the gland in this way would strip the mucous membrane along the floor of the mouth or tear the tissues at the base of the tongue, resulting in marked postoperative dysphagia and dysphonia. The pedicle by which the tonsil remains attached at its inferior pole is separated by means of a snare.

F. S. Mathews² describes a method of enucleating the tonsil by means of the finger, under etherization with a paper cone for from two to four minutes, until the stage of primary anesthesia is reached without obliteration of the pharyngeal or corneal reflexes. The following advantages are claimed for this method: (1) Whole tonsils are removed, a tonsillectomy. (2) The anesthesia is primary and of short duration. (3)

¹ New York Medical Journal, May 29, 1909.

² Annals of Surgery, December, 1909.

The operation requires but a couple of minutes even when adenectomy is added. (4) The armamentarium is simple and cheap; only three instruments are used—a mouth gag, a Mackenzie tonsillotome, and an adenoid curette. (5) Only one assistant is needed—either physician or nurse; in the latter case one can give the anesthetic himself. (6) Skill in enucleating tonsils with the fingers is easily acquired by anyone familiar with the anatomy of the parts. (7) As it is done entirely by feeling, one is not interfered with by the presence of blood and mucus in the throat. (8) Convalescence is no longer or more painful than after tonsillotomy.

PRESENT STATUS OF THE TONSIL OPERATION. With the view of ascertaining the present status of the tonsil operation, George L. Richards¹ addressed a series of questions to prominent laryngologists in Europe and America, and presents the results of this investigation with an analysis of the various answers. The questions considered were: (1) The physiological function of the tonsil; (2) the use of chemical caustics in its treatment; (3) its relation to tuberculosis and the cervical glands; (4) its relation to rheumatism; (5) indications for its removal; (6) the choice of operation; (7) the necessity for re-operation; (8) present technique; (9) the question of hemorrhage connected with the operation; (10) the result as to the voice.

The general tenor of the seventy-seven answers to the first question showed that laryngologists have not concerned themselves very extensively with the physiology of the tonsil or as to its value, when normal, as an arrestor of the entrance of pathogenic organisms, and that in early life it assists leukocytosis and gives off phagocytes, losing these functions when diseased. Seven considered it a lymphatic gland of no special function, and nine as a producer of white cells when in a state of health. Ten considered that it has no function and no physiological value; four that it secretes an antitoxin and furnishes moisture to assist in deglutition, and five considered its function unknown.

The majority were of the opinion that there is a direct relationship between enlarged cervical glands and the tonsil, the tonsil being apparently the gland through which the infecting agent comes, as evidenced by the cessation of adenitis after removal of the tonsils. Only thirty-nine out of the one hundred and thirty who replied to the third question had knowledge of any connection between the tonsil and tuberculosis. From the conflicting testimony on this subject it would seem that the question of the entrance of tubercle bacilli through the tonsil has not been sufficiently determined to render the fact an undisputed one. The relation of the tonsil to rheumatism presented an interesting field, complicated by the doubt as to the etiology of the disease. The investigations of the various authors show the possibility and probability

¹ Transactions American Laryngological, Rhinological, and Otological Society, 1909.

of the tonsil as a portal of infection, and prove that whatever of protection to the organism the tonsil may theoretically have, it is practically of little value; on the contrary, it is not infrequently a decided menace.

The weight of evidence was against the use of chemical caustics.

The indications for the removal of the tonsil were given as follows: Recurrent tonsillar abscess or quinsy; recurrent simple tonsilitis; diseased crypts, with or without hypertrophy; the co-existence of rheumatism and tonsilitis; mouth-breathing; general toxemia of tonsillar origin; impaired nutrition, and systemic dyspnea. Opinions differed concerning the removal of the tonsil in the presence of tuberculosis, some holding that it is not only of no advantage to do so, but that it is a serious disadvantage, in some instances hastening the tuberculous process.

The opinions given in answer to the question as to the preference for tonsillotomy or tonsillectomy showed a gradual perceptible change toward the more thorough operation of tonsillectomy. The necessity for re-operation was not noted when tonsillectomy had been performed, the opinion being held that the remnant of tonsillar tissue left after tonsillotomy is susceptible of becoming hypertrophied.

With reference to the question of anesthesia there was a decided difference of opinion: 63 use ether as an anesthetic for children; 10, gas and ether; 10, chloroform; 1, chloroform up to twelve years of age, ether after this age; 7, ethyl chloride; 5, somnoform; 2, nitrous oxide; 3, ethyl bromide; 2, ethyl chloride and chloroform.

The preference as to the position of the patient for operation was given by 25 to the dorsal for children under general anesthesia; the prone position, one side or the other, was favored by 40; the semi-recumbent by 2; the Rose and Trendelenburg by 7; and the upright by 27. Richards, in comparing reports of accidents, hemorrhage, and the like, did not find them more common when the upright position was employed than when the patient was put in the dorsal or recumbent position. He advocates the upright position unless there are manifest reasons in favor of one of the other positions.

The trend of the reports given showed a leaning toward the complete enucleation of the tonsil, with the capsule, the technique varying with the individual operator. Richards advocates finger enucleation, holding that the separation of the capsule from the muscle can be made very readily and thoroughly with the finger. One advantage of the finger-nail for this purpose is that in buried tonsils, where it is hard to get good traction with the forceps without tearing, and where there might be danger of cutting the pillar with sharp instruments, it is possible by the sense of touch alone to do nearly the entire dissection.

A great variety of experience was shown with reference to the question of hemorrhage, the reports varying from no hemorrhage at all to 10 per cent., while secondary hemorrhage occurred from one to seven days

after operation. From the reported cases there is no particular proof that dangerous bleeding occurs more often in adults than in children. In addition to hemorrhage, injury to the uvula, pillars, or palate, quinsy from incomplete operation and as a result of injury with the snare, double otitis media with double mastoiditis, and acute otitis media were some of the accidents reported.

The question of injury to the voice following the removal of the tonsils was answered guardedly by those who have had most experience with professional singers, admitting that for the time, at least, there is an alteration in the voice, followed later, as a rule, by improvement, most of them having found that higher tones were obtainable than before. Richards believes that the range and power of the voice should be increased, provided the pillars are uninjured, after complete tonsillectomy, as in many cases the tonsil, by its firm attachment to the pillars, especially if enlarged, hindered the mobility of the muscles. He has always believed that the reported cases of injury to the voice were due to the fact that the tonsil stumps were still present, hindering the mobility of the muscular action, or else that the pillars themselves were injured by the operation.

FATAL CASE OF TONSILLECTOMY. A case of death from *status lymphaticus* following tonsillectomy under cocaine-adrenal infiltration is reported by Thomas J. Harris.¹

The patient was a Russian Jew, aged thirty years, apparently in good health. One-sixtieth of strychnine sulphate was given by the mouth after a fluid lunch. One-half hour later the tonsils were injected with about $\frac{1}{12}$ grain of cocaine in salt solution, with 8 to 10 minims of adrenalin 1 to 1000. Immediately following a second injection (a first having been rejected), and the above figures representing the drug amount actually retained from both injections, the patient grew pale and vomited. Deep cyanosis followed. The operation was quickly concluded, when it was discovered that the patient was pulseless, while respiration was continued for some time. The symptoms were those of thymic death. Autopsy showed a markedly dilated right auricle and swollen right ventricle, enlarged axillary and groin glands, and a thymus weighing 18 grams. The cause of death was in all probability an overdilated right ventricle due to an enlarged thymus gland, with the cocaine and adrenalin acting as an exciting cause.

In commenting on Harris' case, Thomas Hubbard adds the history of one fatal case from adrenalin in his own practice. He says this drug has been used with great recklessness, and it is time to call a halt. He thinks that 2 or 3 minims retained in the circulation is the maximum dose. His patient was a healthy young man about to be operated on for septal trouble, and he was under chloroform and ether anesthesia.

¹ Annals of Otology, Rhinology, and Laryngology, September, 1909.

Every reflex appeared normal and respiration was perfect. He was given an injection of adrenalin for hemostasis, but part of it escaped into the stomach, and he received another, so that he probably got from 15 to 20 minims. During the second incision his heart fluttered; he gave twelve or thirteen respirations, and was dead. The adrenalin doubtless escaped into the circulation and caused death.

THE LARYNX.

Antidiphtheritic Serum in the Laryngitis of Measles. Warden¹ makes a plea for the early administration of antidiphtheritic serum in all cases of laryngitis occurring as a complication of measles, even before a bacteriological diagnosis is made. He describes briefly a case illustrating the gravity of diphtheria complicating measles and draws the following conclusions: (1) Laryngitis is a frequent complication of measles. (2) It is occasionally membranous in character. (3) Nondiphtheritic membranous laryngitis in measles is exceptional. (4) In all cases of laryngitis in measles antidiphtheritic serum should be injected as soon as possible.

Treatment of Cicatricial Stenosis of the Larynx. In a discussion on this subject before the Section of Otolaryngology, British Medical Association,² Lambert Lack deals with laryngeal stenosis consequent upon diphtheria. Diphtheria by itself has no direct connection with stenosis, because, in every case that he has seen, a tracheal cannula inserted into an improperly situated opening was the evident cause of the condition. He has never seen it follow genuine tracheotomy. In all the cases one of the laryngeal cartilages had been divided and the tracheotomy tube lay within the confines of the larynx. He has also seen stenosis follow thyrotomy in childhood. All his cases have been less than five years of age. In most of the cases tracheotomy had been done in a hurry, with the result that the opening into the air-passage was made too high through the cartilages of the larynx.

It is noteworthy and unfortunate, that in the old text-books division of the cricoid is recommended in children. The degree of obstruction varies in accordance with the amount of inflammatory thickening. In early cases a low tracheotomy should be performed and the cannula removed from the upper to the lower opening. In a few days or weeks the laryngeal obstruction will improve. Then the cannula should be blocked, at first temporarily and partially, then permanently. The tracheotomy tube should not be removed too early, because, if the patient should take cold, urgent dyspnea might come on, and the tube

¹ Lancet, London, May 15, 1909.

² Journal of Laryngology, November, 1909.

have to be re-inserted in a hurry. This treatment, Lack claims, is successful in all early cases.

Among other methods he has tried thyrotomy and the excision of the scar-tissue from the larynx, fixing a solid plug in its cavity to maintain its patency during the healing process. He has tried the T-shaped tubes for this purpose, but the difficulty was to keep them clean. The plug was worn six months, then removed and the tracheal cannula blocked. This proved successful in some cases, while in others it failed. He has finally concluded that whatever benefits he has obtained were really due to time, and he has decided that it is illogical to treat laryngeal stenosis arising from a tracheotomy tube by inserting into the larynx another foreign body. His experience with intubation in these cases has not been favorable.

Delavan, in discussing the *intubation treatment of laryngeal stenosis*, says that most cases of laryngeal stenosis are due to hypertrophic laryngitis or to cicatrices. He compares adhesions in the larynx with adhesions between two fingers, or with synechiæ in the nose. Simple division of thin laryngeal webs is doubtless frequently quite successful, but incisions made into dense scar-tissue must of necessity reunite. Mucous flaps, to take the part in the larynx that cutaneous flaps take between the fingers, cannot be cut without laryngofissure. Ultimate failure follows cutting operations. Treatment by intubation depends upon the fact that long-continued stretching destroys the resiliency of scar tissue.

In the intubation treatment two things are necessary: (1) That the shape of the tube must be adapted to the shape of the stricture, each case must have its own tube, and (2) the intubation instrument must be large enough to stretch the contracted tissues without tearing them, and the stricture must be kept under continuous tension for at least a year, and sometimes much longer. Patients tolerate the presence of the tube with perfect ease, and children wearing them have passed through scarlet fever, typhoid, and even pertussis, successfully. The fitting of the tube to each special larynx requires care. O'Dwyer, from casts of the normal larynx, made his tubes to fit loosely, but in stenosis the tube must fit tightly, and in order to achieve this object the tubes, in the first instance, must be passed into the larynx under general anesthesia. Patients with hypertrophic laryngeal stenosis will cough up any tube and may strangle, so that in these cases a low tracheotomy should be performed, and then, under full anesthesia, the laryngeal tube inserted.

In most cases a vulcanite tube is preferable, but if it fails a metal tube may succeed for some unknown reason. The objection to the metal tube is that it becomes roughened. When the tube is removed at the end of a prolonged intubation, spasm of the adductors is apt to occur and give rise to the belief that the stenosis has not disappeared.

Therefore, the first removal should be effected under an anesthetic, and if during recovery from the anesthetic, the tube having been removed, dyspnea slowly sets in, the cause is not adductor spasm, and the tube must be re-inserted.

The prognosis and duration of treatment depends upon the nature of the stricture and the patience and skill of the operator. Delavan has seen a case of hypertrophic stenosis cured in four weeks, but cicatricial stenosis may necessitate as many years. When hypertrophic stenosis is once cured, it is not likely to recur. Time is an important factor. It is not yet certain whether, after all, these strictures may not recur at some later date. The same criticism applies to other methods of treatment, particularly to those in which the laryngeal structures are damaged. The drawback to intubation treatment is its tedium.

Emil Mayer thinks that too much stress has been laid upon the difficulties of intubation, and that a very little practice will confer the necessary skill. He describes three unusual cases treated by intubation with complete success. In one of these the introduction of the tube occupied ten minutes, and as the airway was necessarily blocked during the manipulation, he had constructed a hollow introducer to enable the patient to keep on breathing. The first case was a soldier with laryngeal stenosis, the result of a gun-shot wound. On examination the larynx was found to be a funnel-shaped cavity terminating in a narrow slit. There was also a punched-out hole in the soft palate, produced by the same bullet that had injured the larynx. After a course of intubation the tube was removed, but re-insertion was found to be necessary. The patient declined further treatment in order to qualify for a government pension.

The second case was one of perichondritis following typhoid fever. The onset of dyspnea had necessitated tracheotomy. Intubation was successfully accomplished by Mayer and the tube was worn for several months, in the course of which the patient took a trip from New York to Sweden and back. The patient is now well.

In the third case laryngeal obstruction had been caused by a recurrent granuloma. The tumor had been removed, but the tracheotomy tube could not be dispensed with. Intubation was carried out, but the patient coughed up all the tubes until the Rogers' attachment was supplied. After wearing this for a month the stenosis was found to have been cured.

In speaking of the *surgical treatment of laryngeal stenosis*, Delsaux, of Brussels, says that laryngostomy, as perfected by Sargnon and Barlatier, is useful in all kinds of cicatricial stenosis, and as it has proved successful in some very unpromising cases, the prognosis of laryngeal stenosis has now become much less gloomy. The operation consists of laying open the larynx and trachea anteriorly and keeping it open

for a long period, with the employment of graduated dilatation by means of soft-rubber drainage-tubes, introduced through the tracheal opening. It is contra-indicated, however, in cases of tuberculous and lupoid disease.

Thirty-six cases have so far been treated by this method, with the following results:

Cases.	Cured.	Under treatment.	Deaths.	Unsuccessful.	Lost sight of.
36	14	12	6	1	3

Four of the 6 fatal cases died of bronchopneumonia. In the solitary unsuccessful case the dilatation had been kept up for two months only. Up to the present time laryngostomy has proved to be the most successful operation which has been proposed. It can be resorted to as a final measure when other methods of treatment have failed.

Chevalier Jackson¹ describes the technique of *laryngostomy*, and appends a very complete bibliography of the subject. He has treated 7 cases of laryngotracheal stenosis by this method, of which 1 is still under treatment and 6 were cured. The duration of treatment varied from five months to three years. He thinks that with the accumulated experience the cure of the worst cases should not require more than six months, and that in this operation we have a satisfactory method of dealing with these usually neglected cases. Favorable results by this method are also reported by John R. Winslow.² Uchumann³ read an exhaustive article on this subject before The International Congress of Medicine. Kubo⁴ also discusses this subject.

Laryngeal Tuberculosis. Robert Levy⁵ says that pathological conditions of the laryngeal mucosa, especially chronic catarrhal laryngitis, are important factors in the etiology of tuberculosis of the larynx. Pain is not always present in laryngeal tuberculosis. When present it is not always conclusive that the lesion is tuberculous. It may exist without ulceration. He thinks that the beneficial effect of mercurial treatment in laryngeal lesions of tuberculous patients should not be accepted as positive proof of the value of this treatment in tuberculosis. It must be recognized that the differential diagnosis between syphilis and tuberculosis of the larynx is at times extremely difficult, especially when the former exists in tuberculous patients.

Bacteriological confirmation of the diagnosis is often obtainable by examination of smears made directly from the laryngeal lesion. It is necessary to again impress on the general profession the curability

¹ Laryngoscope, September, 1909.

² Transactions of the American Laryngological Association, 1909, p. 177.

³ Norsk Magazin for Laegevid Enskaben, Christiania, October, 1909.

⁴ Transactions of the Section on Laryngology and Rhinology, International Congress of Medicine, Fasc. 1, p. 155.

⁵ New York Medical Journal, September 11, 1909.

of laryngeal tuberculosis. It is especially important that the prognosis be determined by a careful study of the lesion in all its characteristics. Local treatment to be effective must be well selected both as to time of applications and method of procedure.

W. E. Casselberry¹ says tuberculous hyperplasia in the larynx has not infrequently undergone resolution, in whole or in part. Unmistakable tuberculous ulcers have occasionally healed and remained healed. Favorable negative qualities have characterized in common the cases which have proved to be capable of arrest or recovery; for instance, the laryngeal hyperplasia has been less progressive, less diffused, and less prone to ulceration; the underlying pulmonary infection has been less extended; there were fewer tubercle bacilli, a lower pulse rate, and less emaciation. These qualities persisting, the patients who are capable at least of a hopeful resistance can be distinguished, thus justifying every effort at any sacrifice to invoke the methods likely to arrest the disease and lead to recovery, including intralaryngeal surgery when the lesions in degree and kind are suitable for it. In like manner the non-resistant type should be recognized and those patients guarded from the privation and distress which surely follow in the wake of an indiscriminate exposure to the elements and to the hardships of travel in distant climes. In them surgery is contra-indicated excepting to prevent air hunger and suffocation, or to prevent starvation by the removal of some particularly painful impediment in swallowing.

LARYNGEAL TUBERCULOSIS AND PREGNANCY. Glas and Kraus² give the results of their experience with 59 cases of laryngeal tuberculosis in pregnant women, from the clinics of Chiari and Schauta in Vienna. They confirm the unfavorable influence of gestation on a tuberculous process in the larynx. Kuttner has declared that a pregnancy in women with laryngeal tuberculosis is equivalent to a death sentence in 90 per cent. of the cases, and the reported experiences are even more discouraging; none of the 32 women with diffuse laryngeal tuberculosis survived the puerperium. In another group of 11 cases the laryngeal process, originally very mild, became transformed during pregnancy into the diffuse form, fatal in all. On the other hand, in some of the patients in whom abortion was induced, the laryngeal process promptly took a turn for the better. In 20 per cent. of the cases spontaneous abortion occurred and these women all died. Of the 32 women delivered at term, 60 per cent. of the children survived only a few days.

Veit's dictum in regard to the importance of the increasing or declining weight as an index of the severity of the laryngeal process was found useful, but should be estimated always in connection with the general findings. Early in the pregnancy the progressive character of the

¹ Journal of the American Medical Association, August 7, 1909.

² Medizinische Klinik, July 4, 1909.

laryngeal lesion indicates abortion; later in the pregnancy interference has no effect on the progressive laryngeal process, but tracheotomy may relieve, and it has occasionally a direct curative effect.

TREATMENT OF LARYNGEAL TUBERCULOSIS. In discussing the different methods of treatment for laryngeal tuberculosis in vogue at the present time, Bourack¹ comments on the teaching of only twenty-five years ago, that laryngeal tuberculosis was an incurable infection.

The surgical treatment has been bitterly opposed, and for a long time practised by only a few men. Today, with more or less restrictions, it is employed in the majority of clinics. There are, indeed, even partisans of exolaryngeal methods, "laryngotomy, laryngectomy, partial or complete, and tracheotomy." In the last few years there have been repeated in the foreign press new, skeptical views on the treatment of laryngeal tuberculosis. Today there is certainly neither the doubt and despair of 1870 and 1880 nor the enthusiasm of 1890 on the subject. One can now make his examination without partiality. Above all, we can actually assert as proved, the view that laryngeal tuberculosis ought to be treated energetically as a local affection, and that we ought not to confine ourselves to treatment of the lungs, nor to a belief that a physiodietetic treatment is sufficient. Great attention should be paid to the condition of the lungs.

The observations of the last ten years show that pulmonary tuberculosis, especially fibroid forms, can be healed; nevertheless the lesion of the larynx is an independent one, as is shown by the fact that we can get healing here while the disease in the lungs advances. This destroys the argument of those who say all that is required is to get the pulmonary condition better. It must not be forgotten that the laryngeal affection left to itself has a tendency to progress and spontaneous healing is a great rarity. In the majority of the most important clinics of the world the choice of medical or surgical remedies varies with the condition in the particular case. Medical treatment is, however, insufficient, as we do not know of any medical specific against it. No one has any longer the faith in lactic acid, menthol, etc., which he formerly had. Krause, the discoverer of lactic acid, today recommends intravenous injections of betol. While energetic applications of lactic acid, 50 or 75 per cent., or even pure, or of parachlorophenol or phenolsulfuric acid, or the mixture of Bonain, have at times produced healing, at other times they are entirely powerless.

There are today few opponents of the surgical treatment of laryngeal tuberculosis, if one can judge from literature. The difficulty is to determine the precise indications for its employment. We can say, however, in general, that the cases where operative intervention is to be employed are more limited than was the case ten years ago.

¹ Archives Internationales de Laryngologie, July, 1908, to January, 1909.

The onset of laryngeal tuberculosis presents itself under such a variety of forms that no general system of treatment can satisfactorily be established; each case requires its own particular line of treatment. Authorities now insist upon one feature which cannot be overlooked—the healing tendency of the organ; it is due to this that the curette or galvanocautery are a benefit at times with extensive infiltration and at other times are powerless against infiltration or against ulceration which does not appear extensive.

It is on account of this that indications for operative intervention are, according to the most recent authorities, fixed in such an uncertain manner. In general, however, the limits have, in the last years, been notably changed compared with those given by Krause. For example, Imhofer does not regard an advanced general condition and a pronounced local process as a contra-indication to operation, because, according to his opinion, laryngeal tuberculosis is curable in the advanced stages. Kuttner operates even when the laryngeal lesions are extensive.

Bezold formerly operated for a bad general condition, particularly with the aim of relieving the patient when suffering from dyspnea and dysphagia, but after a number of failures he has become more prudent in the choice of his cases; he no longer operates when the erosions are of slight extent, if the infiltrations are not ulcerated and if the process does not present any signs of rapid advance. On the other hand, he hastens to operate in cases where the infiltration shows a distinct ulceration and is commencing to advance, if there are ulcerated indurated borders and if there is a tubercle under the ulceration. Contrary to Mermod and Grünwald, he does not use the galvanocautery except rarely, never when the infiltration and inflammation are extensive. From his experience as director of the Sanatorium of Falkenstein, he has no confidence in tracheotomy and believes all exolaryngeal methods involve too much risk.

Gleitsmann announced, in 1903, the following indications for curettage: (1) Primary laryngeal tuberculosis; (2) limited infiltration and ulceration; (3) indurated infiltration of the interarytenoid space and infiltration of the arytenoid cartilage and the false vocal cords; (4) in the initial stages of pulmonary affection; (5) in advanced pulmonary tuberculosis with dysphagia, the result of inflammation of the arytenoid.

Heryng in the first years of his enthusiasm operated even upon the most advanced cases, but in recent years he has become more circumspect, and gives the following indication, for operation: (1) Tubercles of the epiglottis; (2) chronic infiltrations of the posterior wall; (3) chronic tubercles upon inflamed tissues resisting other methods of treatment; (4) affection limited to one region of the larynx.

Krause operates also in cases of diffused infiltration of the false vocal cords, posterior wall, and epiglottis, and in extensive ulceration when there are extensive lesions in the lungs.

The Vienna school is in general more conservative than is the Berlin school.

Hajek does not operate except when there are very small ulcerations and the general condition is satisfactory.

At the meeting of the Laryngological Society of London the majority of those present expressed themselves in favor of the endolaryngeal methods in the treatment of laryngeal tuberculosis.

Semon regards perichondritis of the arytenoid and edema as contra-indications, and that success is less likely where there is general inflammation.

Levy uses curettage in cases of limited ulceration, and not alone in cases of ulceration which show a tendency to advance. He advises excision in cases where one can hope to be able to entirely remove the diseased part and the galvanocautery in cases of superficial ulceration of small extent. Tracheotomy can be employed in others, but never total resection.

Finder and Alexander, from the clinic of B. Fraenkel, recommend curettage particularly in tubercles and ulceration of limited extent, and they regard advanced pulmonary trouble as a contra-indication. They never touch indurated infiltrations on the posterior wall. The best results, according to Finder, are obtained by the use of curettage where there are ulcerations of the false and true vocal cords or epiglottis. Exolaryngeal methods have not been received with great favor.

Blumenfeld reported 54 cases of laryngotomies performed for tuberculosis, while Gluck, out of 250 cases, has done 13 for tuberculosis; in 11 of these there was a good result obtained.

Exolaryngeal methods are recommended by many authors in cases of laryngeal tuberculosis in pregnant women. Contrary to the usual impression, such a condition in pregnancy is not rare; almost all the patients die after confinement. Tracheotomy has rarely had a favorable action, probably because it was practised too late. Authorities differ about the advisability of performing an abortion. Tracheotomy has been recommended as a therapeutic means in laryngeal tuberculosis since 1868.

M. Schmidt, in 1897, gave the following indications for tracheotomy: (1) Laryngeal stenosis; (2) grave lesions of the larynx, if the lungs are not seriously affected in the absence of stenosis; (3) the rapid progress of the disease before the appearance of dyspnea. Later, Schmidt did not insist upon the indication furnished by the lungs.

Chiari believes an early tracheotomy has a favorable effect not only upon the evolution of the laryngeal affection, but also upon the pulmonary affection. Nevertheless, in adults, in spite of the great authority of Schmidt, tracheotomy plays an inconsiderable role in the treatment of laryngeal tuberculosis. The operation has been condemned by Mackenzie.

Krause asserts that by immobilization of the diseased organ one can hope theoretically to obtain improvement in the local condition; he has, indeed, witnessed two favorable actions. These favorable results are, however, rare, as a rule, when the condition of the lungs is advanced. Generally when employed, after the operation the expectoration becomes more abundant, the disease advances and the suffering of the patient is, at times, greatly increased.

Mermod is also opposed to tracheotomy, especially as he has observed two cases of extensive ulceration around the tracheal wound. The other methods—electrolysis, cauterization, and incision—are of much less importance.

Mermod was at one time enthusiastic in the use of electrolysis, but he has now abandoned it except in advanced cases, on account of the time necessary. He employs the monopole cathode introduced into the larynx with a current of 15 to 20 milliamperes, and also employs it in the case of voices of professionals when redness or slight infiltration of one of the vocal cords exists. The incision is also very little employed today. The most frequent form of surgical treatment is the curette.

More recently the employment of the galvanocautery has come forward.

Grünwald, in a recent article (1907), warmly recommends deep cauterization for the purpose of destroying morbid tissue, thus avoiding, so far as possible, any reaction in the tissue and without destroying, without definite object, the mucosa in order not to give a channel for the spread of the affection. Where the lesions are well defined, and particularly when situated in the interior of the larynx, he practises laryngofissure. In affections of the vestibule of the larynx, and especially in the lower portion of the pharynx, he practises subhyoid pharyngotomy. If there is perichondritis, he practises a partial resection. If there is grave stenosis, he practises tracheotomy.

Mermod makes use of cauterization in many hundreds of cases, even in those with grave complication. He has abandoned curettage since he had two severe cases of hemorrhage. One advantage of the galvanocautery over the curette and cutting instruments is its smaller diameter. In his opinion it is necessary to destroy all the diseased tissue which is accessible to the eye and instrument. It makes no difference to him whether the infiltrations are ulcerated or not. Many months are often necessary, because long intervals have to elapse between treatments. He believes that the indications for its use should be enlarged to the greatest possible degree. He has indeed obtained good results in cases which seemed to be most desperate. He does not give any precise indication, but takes into account, as do Finder and the others, the healing tendency. If the operation increases the trouble there is little probability that one can obtain success; but in the sluggish cases he believes in energetic local treatment not only with

the aim to heal, but at least to relieve the suffering of the patient. He has observed 10 cases where the laryngeal affection remained for a long time the only manifestation of tuberculosis. Out of 280 cases treated by galvanocautery, 60 have remained healed for a year after the operation, 40 for more than two years, 17 for more than three years, and 1 has had no return in sixteen years.

In recent years attention has been turned to phototherapy, *x*-rays, and radium. The results unfortunately do not allow us to form any opinion at present as to their value.

In concluding, Bourack says that up to the present time we have no method which is a sure cure for laryngeal tuberculosis. Nevertheless, we cannot question that energetic treatment often obtains good results where expectant treatment would allow the patient to perish. In our treatment the patient should be placed under the most favorable climatic and hygienic conditions, employing the best surgical means at our disposal, generally curettage or galvanocautery. Sur-alimentation is of the greatest importance, and to that end all the functions of the stomach and intestines should be looked to. Constipation should be avoided; proper breathing through the nose is essential. All of these methods can be more easily applied where the patient can receive the constant attention of a physician and is subject to a regular regime. This can be best done in a sanatorium. The climatic conditions of a sanatorium play an important role. It is then of the first importance to take into consideration the form of the affection when one advises the removal to a particular altitude. This will depend upon the form of the affection—whether it is torpid, the cough dry or the expectoration abundant. (1) We have a choice of treatment by pure air. (2) treatment by the sun's rays. (3) Treatment by elevation and altitude. (4) By sea air and sea baths. Air rich in ozone is desirable, humid air is to be avoided. The patient should be protected from the cold north winds and placed where cloudy days are not frequent nor changes in temperature sudden. The importance of solar baths is today admitted.

Authorities differ regarding the advantages of mountainous airs for patients with febrile symptoms and affected with congested form of laryngeal tuberculosis. It is a fact that dry mountainous air has a good effect on patients who suffer from abundant expectoration, while sea air is much more desirable for patients who have a dry cough. The sea air is badly borne by those who suffer from congested forms. Chronic and pronounced laryngeal catarrh, which is often found, ought to make us think of the possibility of tuberculosis, especially in those of an early age. With these general measures it is important to employ local treatment. From a critical study of the various published works and from my own personal observations we should proceed as follows: During the first few weeks no operative intervention

should be undertaken. The patient can employ at home, many times a day, disinfecting and inhalation treatments. Further, we can use injections or cauterizations by using lactic acid or formalin or a mixture of lactic, chromic, and formalin or a mixture of lactic, formalin, and phenic acid or by methylene blue.

It is important to recommend to the patient to avoid all fatigue from voice use.

Korner has, in a recent communication, recommended iodide of potassium. If this medical treatment does not answer and if limited infiltrations should have a tendency to ulcerate, especially when they are located on the true vocal cords or in the arytenoid space, or upon the epiglottis, the employment of the curette is indicated. This should be used with confidence and energy after thorough anesthesia. Such an operative treatment should not be undertaken when we are dealing with congested forms if the pulmonary lesions are deep, but we should not be stopped by this contra-indication. In cases of granulation, which precede stenosis, we must not wait too long. When it is possible we should remove the granulation with cutting forceps. In the case of superficial infiltrations upon the epiglottis or the vocal cords, especially if diffused on the free borders, and if the affections are found below the vocal cords, the curette is insufficient. It is necessary then to employ the galvanocautery. Nevertheless, when one knows how to make use of the curette it can also be used when the process is largely extended, when, for example, there are large ulcerations of the epiglottis, false vocal cords and the arytenoid space. In the case of large and profound infiltrations we can attempt the destroying of them by deep cauterization. Vegetations of the posterior wall of the larynx, which, as we know, often proceed for a long time without ulcerating, ought, by preference, to be left alone, at least if they do not show any tendency to break down and if the functional troubles resulting do not become more severe, producing loss of voice and painful dyspnea. If the operative intervention is badly borne it will be necessary to abandon it. When there is danger of suffocation as a result of the infiltration and granulation, tracheotomy will have to be performed if the physician is opposed to curettage.

Lipoma of the Larynx. In investigating this rare tumor of the larynx, Max A. Goldstein¹ found but twelve authentic cases reported, the records of which he reproduces, and adds an interesting case which came under his own observation. His patient was a married woman, aged thirty-three years, with a double lipoma of the larynx. A globular growth occupying nearly the entire lumen of the larynx was removed with the cold wire snare, revealing a second growth beneath. In an attempt to remove this growth with the snare it became impossible

¹ Laryngoscope, July, 1909.

either to cut through the growth or to disengage the wire. The entire mass, snare, tumor, and larynx, was pulled forcibly upward and forward into the cavity of the pharynx, and then the pedicle of the growth was cut through with a pair of curved scissors. By microscopic examination the growth was verified as a typical lipoma.

Voice Production. In a paper on "The Action of the Respiratory Muscles in the Production of Voice," G. Hudson Makuen¹ says the most important thing in voice production is good and efficient breathing. Good breath control is absolutely essential to good voice production. There may be various methods of controlling the breath in voice production, but there is only one best method. Breathing may be divided into two classes, passive and active breathing. Passive breathing is that which is used for all ordinary purposes, such as merely aërating the lungs, and active breathing is used for extraordinary purposes, such as singing and speaking.

In passive breathing the aëration of the blood is the chief purpose, whereas in active breathing it is of secondary consideration. The inhalation of passive breathing is due to a slight contraction of certain muscles including the diaphragm, while the exhalation is purely passive and due to recoil of these muscles and of the air cells to their original condition. The inhalation of active breathing is much more extensive, and consists in the wide expansion of the thoracic cavity by means of a more or less vigorous contraction of the rib-raising muscles. In active inhalation the diaphragm takes no part whatsoever, because its contraction interferes with the upward and outward movement of the ribs. The exhalation of voice production consists in the relaxation of the rib-raising muscles, and a more or less vigorous contraction of the rib-depressing muscles, the chief of which are the diaphragm and the abdominal muscles. During the inhalation of voice production, the diaphragm and abdominal muscles should be entirely relaxed, so that at the point of fullest inhalation the recti muscles extending from the symphysis pubis to the ensiform cartilage should form or approximate a straight line.

Any protrusion of the anterior abdominal walls during inhalation interferes with the expansion of the ribs, and therefore with the fullest breathing. In the exhalation of voice production the diaphragm and abdominal muscles contract simultaneously and to a degree commensurate with the amount of breath pressure required. For strong and impassioned tones, the breath pressure is sometimes very great. The action of the respiratory muscles in the production of voice is very important, and it must be acquired by long practice properly directed. Defects of voice and speech are due in large measure to faulty breathing, and successful voice culture or voice building depends almost altogether upon the accuracy and efficiency of breath control.

¹ Laryngoscope, September, 1909.

Makuen's conclusions are: (1) The action of the respiratory muscles in voice production differs in some important respects from their action in passive breathing. (2) While the function of the diaphragm is inspiratory in passive breathing, it must be expiratory in active or artistic breathing. (3) Although the diaphragm is generally classed among the involuntary muscles, its action, like that of so many other so-called involuntary muscles, may be brought entirely within the domain of the will. (4) The proper use of the respiratory muscles for singing and speaking may be acquired by practice, and should be taught by the teachers of voice culture.

Phonasthenia in Singers. Since Flatau first described phonasthenia, or functional weakness of the voice, in 1906, Imhofer¹ has observed thirty-six cases. Phonasthenia is defined as a disturbance or loss of function without a mechanical interference as the primary cause. Any waste of power may lead to phonasthenia, and therefore any incorrect method of voice production, which is indeed the most common cause, may produce the condition, although it frequently occurs in anemia. Most patients believe they suffer from a cold; they have a feeling as if mucus or something was in their throat, and a constant desire to clear the throat. On examination nothing may be found, or there may be slight turbinal enlargement, septal deviation, granular pharyngitis, while in the larynx irregularity of the margins of the vocal cords or a sharply defined injection.

Certain evidence that the condition is present is obtained by testing the voice, for the trained ear can detect errors in the production of the sound usually in one register; this is most marked with soft notes, least marked when singing forte. This can be obviated by three methods: (1) By use of the faradic current during intonation; (2) by compression of the larynx; (3) by vibratory massage. Imhofer employs the first method; the tone then becomes pure, and the diagnosis of phonasthenia is complete. Treatment consists in the application of the faradic current.

¹ Prag. med. Wochens., 1909, xxxiv, S. 227.

OTOLOGY.

BY ARTHUR B. DUEL, M.D.

The Labyrinth. Another year has been marked by the pursuance, with unabated enthusiasm, of the important questions revolving about the subject of *acute and suppurative labyrinthitis*.

Great interest was manifested in these problems at the International Otological Congress held in Budapest last August. One-half of the Lenval Prize, awarded every three years for the most important original work on otology, was presented to Neumann, of Vienna, for his work on the labyrinth; while Bárány received honorable mention for his investigations and caloric tests of the static equilibrium in connection with the vestibule and semicircular canals. The other half of the Lenval Prize was awarded to Dr. Albert Gray, of Glasgow. Repeated experiments by a large number of careful observers throughout the world have all tended to corroborate those of Bárány, founded on the well-known experiments of Ewald.¹ Many points which were doubtful, and for a time the subject of most active discussion, are now accepted as established facts, and practical rules for examination of the static equilibrium and functioning powers of the labyrinth have been formulated.

THE PHENOMENA OF VESTIBULAR IRRITATION, according to these formulated rules, are most easily explained on the theory of Breuer-Mach and Crum-Brown, a simple hydrodynamic theory which is easily grasped and (correct or incorrect) furnishes a sufficient theoretical peg on which to hang practical ideas. Since repeated experiments and clinical phenomena, as they are more carefully studied, invariably give identical results which support this theory, we may, at least, accept the hypothesis for practical purposes, inasmuch as it furnishes us with a means of diagnosis and indications for operation which mark a great advance in otological surgery.

Those who are interested in highly theoretical controversies will find much pleasure in v. Cyon's work, which devotes more than 400 pages to an elaborate thesis entirely disproving (?) the hydrodynamic theory. Fridenberg, in a paper of ten pages, entitled "Space and Time as Aural Concepts: A Review of v. Cyon's Theory of the Labyrinth,"² which

¹ Physiologische Untersuchungen über das Endorgan des Nervus Octavus, pp. 255 to 266.

² The Laryngoscope, October, 1909.

in itself is sufficiently involved, says in a foot-note: "Nagel, who has given us perhaps the most clear and detailed account of the present theories of labyrinthine function and an analysis of the visual, auditory, and combined views of the equilibrational function, admits that he does not understand the theory of v. Cyon, so that the writer is estopped by weight of authority from laying claim to any but a most general and insufficient comprehension."

Inasmuch as a clear understanding of the phenomena based on the simpler theory requires careful study, and since their comprehension is of such great practical value, it seems wiser to devote one's energy to grasping the practical facts connected with the phenomena rather than to become too much involved in theoretical considerations as to their production. Several articles have appeared in which it is evident that these facts either had been misunderstood or carelessly presented by the writers. Under these circumstances, I may be pardoned for calling attention to some established facts before certain important papers and discussions in the literature of the year are presented.

It has been definitely established that under certain stimuli the labyrinth, in normal individuals, will invariably give rise to definite reactions. These reactions correspond with those obtained by Ewald in his early experiments on the semicircular canals of doves, and have been corroborated by many observers, notably Neumann and Bárány, of Vienna.

Ewald¹ proved by his experiments, in which he caused movement of the endolymph first in one direction and then the other, by alternate compression and suction on each canal separately, (1) that endolymph movements in the semicircular canals are invariably accompanied by a simultaneous rotation of the eyeballs in their sockets; (2) that this rotation invariably takes place in a plane parallel to that of the semicircular canal in which the endolymph movement has been excited; (3) that the rotation invariably takes place in the direction in which the fluid moves in the canal, *e. g.*, when a movement of the endolymph was excited in either horizontal ("external") semicircular canal from right to left, the eyeballs rotated simultaneously (on a vertical axis), in a horizontal plane, from right to left—reversal of the current caused a rotation of the eyeballs from left to ^rright—when a movement in the endolymph was excited in the right superior vertical ("superior") canal, from behind forward, the eyeballs rotated clockwise in the plane of the canal from above downward and to the ^rright; when the current was reversed the eyeballs rotated in the same plane from below upward and to the left; when the endolymph movement was ^rexcited in the right posterior vertical ("posterior") canal from above downward, a rotation of the eyeballs took place from left to right ("counter-clockwise")

¹ Physiologische Untersuchungen über das Endorgan des Nervus Octavus, pp. 255 to 266.

in the plane of the canal; when the current was reversed a similar rotation occurred from right to left ("clockwise").

Inasmuch as the vertical canals lie in planes which are practically at right angles to each other, endolymph currents in the left superior or posterior verticals would bring about movements of the eyeballs exactly opposite to those on the right. It may thus be seen that two canals acting simultaneously would give resultant vertical movements either upward or downward, according to the direction of the endolymph current.

In these experiments the movements of the eyes were more marked when the endolymph current was toward the ampulla in the horizontal canals, and when away from it, in the superior and posterior vertical canals. It is of practical importance to bear this in mind in making functional tests by means of heat or cold or turning, and can be easily recalled by remembering that the stimulus which produces a current, (in any given canal), toward the opposite ear, should normally give the most marked movement of the eyes.

These experiments simply produce an exaggerated form of the response to the normal stimuli which result from the movements of the head. Motion of the head in any direction causes a wave current in the semicircular canals which occupy a relatively similar position in space. This current, by inertia of the endolymph, takes place in a direction opposite to the motion of the head. The stimulus of this current is transmitted to the hair cells of the crista ampullaris, thence "through the vestibular ganglion and nerve, with its nucleus in the medulla, to Deiters' nucleus."

"From Deiters' nucleus fibers radiate (1) to the nucleus of the motor nerves of the eye on both sides, and (2) to the motor neurones of the spinal cord on both sides. Through the former the ocular movements of vestibular nystagmus are induced, and through the latter is brought about the irregular gait which characterizes violent excitation of the vestibular system."

If an individual with normal vision is directed to fix his gaze on an object held directly in front of his eyes at a distance of two feet, and his head is alternately rotated slowly from side to side in a horizontal plane, nodded up and down, and flexed sidewise toward each shoulder, the eyeballs will be found to rotate, in the same plane and in an opposite direction, synchronously with each movement of the head.

These rotations of the eyeballs are exactly similar to those produced by Ewald's experiments, and result from the reflex produced by a wave current in the endolymph of the three semicircular canals, respectively, acting upon the ampullary nerves, and (through the tract to Deiters' nucleus) reflexly to the motor nerves of the muscles of the eyes. If the rotation of the head is made very rapidly the eyes will be seen to fail in attempting to fix the object, and will then be observed to pick it up again by a rapid movement.

If the head is now immobilized and the object moved across the field of vision in different directions, the eyes will be observed to follow up to a certain speed with smooth and accurate movements in the same plane. Above 45 degrees per second, however, the fixation cannot be preserved, and it will be regained by jerking movements of the eyeballs.

Here we have depicted the two movements which constitute labyrinthine nystagmus: (1) The *slow movement* of fixed attention on a stationary object when the head is moved; (2) the quick jerking of the eyes in the opposite direction when the limit of deviation has been reached in "movements of pursuit" of objects which are passing rapidly before the eyes.

Any artificial stimulation of the canals, whether due to cold or heat ("caloric tests") or to turning in different directions, with the head in positions to bring the different canals into the horizontal plane, brings about "nystagmus" by setting up endolymph currents in different directions in the canals, the reactions from which are exaggerated forms of those just described. These reactions always conform to the same laws.

The rapid movement of the currents in the endolymph produce the *sensation of the movement of objects across the field of vision in the plane of the canal irritated*, the eyes follow these apparently moving objects ("active pursuit") until the limit of deviation is reached, when by a reflex action the eyes are snapped back to "fix" another object, which is again followed to the limit of deviation, and so on. The movement of "pursuit" is the "*slow movement of nystagmus*," and takes place in the plane and direction of the endolymph current in the canal. The *rapid snap back* of the eyes to fix another object is the "*rapid movement of nystagmus*."

Inasmuch as the first or slow movement is directly dependent on the vestibular irritation, it would seem more appropriate to designate the type of nystagmus (*i. e.*, the plane and direction) from this. However, this has not been the practice, and consequently the whole matter has been rendered more confusing by *naming the type from the rapid movement*. This necessitates reversing in one's mind the natural train of events in the cause of the phenomena of vestibular irritation, whether from experiment or diseased conditions, in order to name that phase of it which really only represents the effort of the eyes (by a reflex outside of the labyrinth) to regain their normal position. The plan has all the awkwardness of thinking in one language and speaking in another, although the confusion disappears after one has become familiar with the causation of the phenomena.

It can be readily understood that it is quite impossible in the caloric tests, or whirling tests, to stimulate one canal alone. The type of nystagmus will therefore be the resultant of two or more forces acting at the same time. There may be a combination of vertical and hori-

zontal currents giving rise to oblique movements in almost any conceivable axis; combinations of horizontal and rotatory movements, either clockwise or counter-clockwise, etc. As a matter of fact, it is difficult to think of the canals occupying the three directions in space with mathematical exactness, considering the constant movements of the head. It is correct, however, to think of the movements of the eyes as being *exactly in the plane of the canal irritated when only one is acting*; or as being in a *resultant plane corresponding to two different forces when two are stimulated at the same time*.

There is much ground for belief that the function of orientation is accomplished by a sense as "special" as that of sight or hearing. The accuracy of the function depends as much on the impression of the plane and direction of motions in space, coming from two sources, as the appreciation of distance depends upon bifocal vision, or appreciation of direction of sound depends upon binaural hearing.

It is undoubtedly for this reason that two systems of semicircular canals are provided. If the position of the semicircular canals be carefully observed, it will be noted that the planes of the superior verticals converge posteriorly to meet at right angles, while the planes of the posterior verticals converge anteriorly to meet in the same manner.

It will also be noted that the superior vertical on either side lies in the same plane and direction as the posterior vertical of the opposite side, only on a higher level and anterior to it.

It will also be noticed that the plane of direction of the superior vertical, if carried forward, would be parallel with one touching the outer canthus of each eye. This represents the limit of lateral deviation of the eyeballs.

The resultant of a stimulation of both sides at the same time (which would happen in nodding of the head) would be a movement of the eyeballs vertically upward on nodding downward, and vertically downward on nodding upward. This is precisely what occurs when both labyrinths are intact. The objection to this theory, that individuals after the loss of one or even both labyrinths are able to walk without staggering, does not disprove it. Persons learn to compensate in a measure for the loss of one or both eyes or ears, but it will not be contended that they see or hear as well as a normal individual. Just so the person with only one-sided or no vestibular sense compensates in a measure for his loss, but never perfectly.

Without going into the details of explanation, the accompanying vertigo and ataxia in irritation of the labyrinth result from currents in the canals, and follow the same laws. Where strong stimuli by whirling movements, or heat or cold, are provoked, the rapidity of the apparent movements of objects (always in the direction and plane of the movement of the endolymph in the semicircular canal, or a resultant plane and direction which is the mean of the two forces, if two canals

are irritated simultaneously) causes the sensation of vertigo, owing to the inability of the eyes to fix on a single object further than the limit of deviation of the eyeball.

Directly following the reflex impulse set up by this "limit of deviation," or coincident with the effort of the eyes to follow the moving object, there is an effort at rotation of the head in the same plane and direction (set up through the tracts from Deiters' nucleus to the motor neurones of the cord on both sides) for the purpose of allowing the eye to "fix" one object. The limit to this possibility soon being reached, the ataxia results. It will be noticed that this is always in the direction and plane of the irritation of the canal (like the slow movement of nystagmus); therefore we again meet with the puzzling way of expressing the form of ataxia by having to say that it is "*away from the direction and plane of the nystagmus*," which, as we have seen, is always named from the reflex rapid effort at recovery made by the eyes, rather than from the slow movement which is the direct result of the labyrinthine stimulus.

It is very obvious that the laws of the movements of the eyes which follow vestibular irritation being known, tests which show definitely whether the functions of the labyrinth on either side are present or absent are of great value in determining the extent of disease.

Thus, we appreciate the importance of the caloric tests of Bárány, which have the advantage of affecting only one labyrinth, so that it is possible to determine if it is functioning.

Kerrison, in a paper read at the meeting of the American Laryngological, Rhinological, and Otological Society, June, 1909, "The Phenomena of Vestibular Irritation in Acute and Suppurative Labyrinthitis, with Special Reference to the Studies of Dr. Bárány,¹ of Vienna," gives a valuable résumé of the subject.

The caloric tests as elaborated by Bárány depend on the facts that: (1) Irrigation of either ear of a normal individual with water at a body temperature causes no apparent phenomena; (2) irrigation of the same ear with cold water (86° or lower) causes in a short time (*a*) rotary nystagmus toward the other ear, (*b*) vertigo, (*c*) ataxia; (3) irrigation with warm water (104° to 110°) causes (*a*) rotary nystagmus toward the same ear, (*b*) vertigo, (*c*) ataxia.

Bárány explains the phenomena on the theory that convection currents are set up in the endolymph of the ampullar end of the anterior vertical canal (cold producing a current downward, heat upward). This, in the right ear, would give rise to a rotary nystagmus, as follows: slow rotation of eyeballs counter-clockwise, downward and to right; recovery, quick movement, rotation clockwise to left and upward

¹Transactions of the American Laryngological, Rhinological, and Otological Society, 1909; and Annals of Otology, Rhinology, and Laryngology, September, 1909.

or "rotary nystagmus, clockwise." Heat would cause rotary nystagmus counter-clockwise by a reversal of the process.

The Rotation Experiment. It can be readily seen that rapid rotation in either direction with the head erect will produce exaggerated endolymph movements in the opposite direction in the horizontal semicircular canals. This will produce a slow movement of the eyeballs in the direction of the endolymph movement and a rapid recovery, or nystagmus in the opposite direction. Thus whirling to the right produces nystagmus to the right. Sudden arrest of the whirling causes a reversal of the endolymph movement, and the "after nystagmus" resulting from whirling to the right would be toward the left. The vertical canals can be influenced and their function thus tested by whirling movements, with the head placed in turn so that their planes are made practically horizontal. The reactions follow the laws we have just gone over, and one has only to bear in mind the position of the canals to account for all the accompanying phenomena of nystagmus, vertigo, and ataxia.

Kerrison, in the paper just referred to, in order to show the application of the caloric tests, briefly calls attention to the vestibular symptoms in acute suppurative labyrinthitis.

"Let us assume that the patient is suffering from a suppurative otitis media of the right ear, from which the infection has spread to the inner ear. Shortly, or immediately, after the invasion of the labyrinth, he experiences distressing vertigo, which usually, but not invariably, forces him to go to bed. Examination of the eyes discloses marked nystagmus toward the left (sound) side. The nystagmus is, at this time, usually present in whatever position the eyes may be turned, but is aggravated when they are turned toward the left (*i. e.*, in the direction of the quick nystagmic movement), and is minimized when they are voluntarily held in the opposite direction. The vertigo is usually of rotary character, surrounding objects seeming to rotate about him in a bewildering fashion. If supported in the upright position, objects seem to rotate in a vertical plane, usually from the right (diseased) side toward the left. Occasionally they seem to rotate in the opposite direction. When lying upon his back the plane of seeming rotation is changed from the vertical to the horizontal. With eyes closed, he has the impression of himself rotating. If able to stand, he is markedly unsteady; and with eyes closed, falls, or tends to fall, to the right (diseased) side. At the onset nausea and vomiting are very frequent, if not invariable symptoms. All these symptoms are of lessened severity while he lies quietly in bed. He usually maintains voluntarily, therefore, a quiet position.

"All of the above symptoms usually subside fairly rapidly and in certain regular order, that is to say, the vertigo and ataxia regularly disappear before the nystagmus. By the end of the first week the

vertigo may have ceased to distress the patient as he lies quietly in bed, while the nystagmus may still be very marked. Sudden or violent head movements may, however, induce recurrence. From the end of the second to the end of the fourth week not only the vertigo and the ataxia, but also the spontaneous nystagmus, may have completely disappeared. The patient is now free from subjective symptoms referable to vestibular irritation, and may be able to walk, or move, in all normal ways without discomfort. He has now entered upon the stage of the disease in which it is of the greatest importance to gauge the amount of injury to the labyrinth by means of the caloric test.

"Deductions to be Drawn from the Caloric Reactions. 1. If irrigation of the diseased ear is followed by normal reactions, we may assume with confidence that the labyrinth has been the seat of a comparatively mild lesion which has undergone resolution, leaving the vestibular structures intact and functioning. Prognosis good.

"2. If, on the other hand, after irrigation with heat or cold, persisted in from three to five minutes, no caloric reactions are induced, we may conclude that the labyrinth is the seat of a suppurative process which has either destroyed the vestibular structures, or, at least, has resulted in an injury sufficiently severe to have annulled the vestibular function or irritability to thermal stimuli. This condition describes the so-called latent stage of suppurative labyrinthitis, in which the ultimate prognosis is grave."

In the minds of many, Bárány's name has been associated chiefly with the caloric test. Kerrison believes that the value of his studies depends equally upon the fact that they have enabled him to establish certain more or less definite constant relations between vestibular nystagmus and the attendant phenomena of vertigo and ataxia. Accepting his hypothesis that the spontaneous nystagmus of labyrinthine disease and the induced nystagmus of experimental vestibular irritation are governed by the same laws, he asserts that we may resume our studies of labyrinthine disease with a surer hand.

Bárány has formulated the laws governing spontaneous vertigo and ataxia of vestibular disease as follows:

"(a) Spontaneous vertigo of vestibular origin is always accompanied by spontaneous vestibular nystagmus, and is always increased when the eyes are voluntarily turned in the direction of the quick nystagmic movement.

"(b) Vestibular ataxia is always accompanied by vestibular nystagmus, and is always influenced by the position of the head.

"(c) A person having vestibular nystagmus tends to move in the plane of the nystagmus and to fall in the direction opposite to the quick nystagmic movement."

Kerrison maintains that if there are constant relations between the three components of the symptom complex characteristic of acute

labyrinthine disease, as Bárány believes, it is obvious that we have control tests by which we may gauge the value of single symptoms. For example, he says: "Vertigo which is not accompanied by nystagmus, even when the eyes are turned strongly away from the suspected labyrinthine lesion, and which is not influenced by the position of the eyes, has little value as pointing to labyrinthine disease. Disturbances of equilibrium which are not accompanied by nystagmus, and are not influenced by the position of the head, can hardly be assumed to be of vestibular origin."

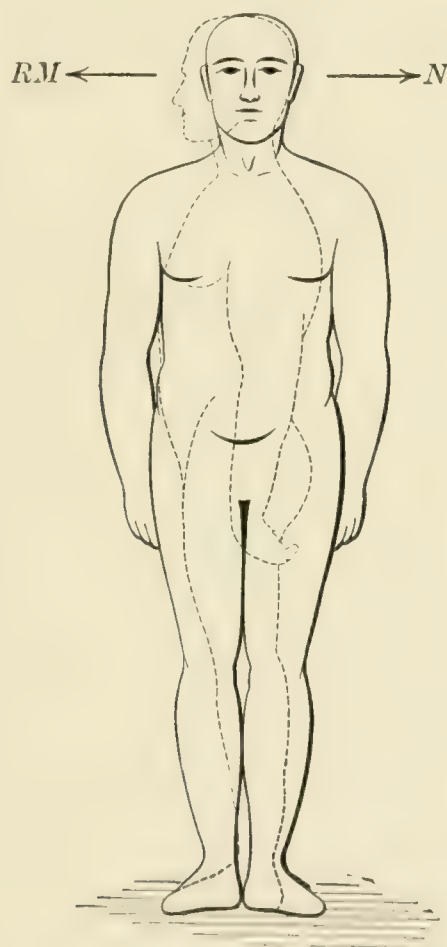


FIG. 6. — *N*, direction and plane of nystagmus; *RM*, reaction movement (*i. e.*, direction and plane in which body tends to move).

He discusses the laws governing vestibular ataxia, and relates some experiments testing their value as applied to the ataxia following the rotation, or turning, experiment.

He presents law "c" more closely, and avoids apparent contradictions by making it read: "A person exhibiting vestibular ataxia tends to rotate within the plane of the nystagmus and in the direction opposite to that of the quick nystagmic movement."

His description of the ataxia with the accompanying figures is very lucid. He says: "The tendency to rotation is about an axis passing through the patient's head, and he falls, or tends to fall, only as this

rotation, modified by his contact with the earth, throws his body in one or the other direction.

“Let us now observe a person who, seated with head erect, has been turned ten times *to the right*. When the rotations are suddenly stopped, he exhibits well-marked horizontal nystagmus *to the left*. He also experiences vertigo. Let him at once stand and, with head still erect and feet closely approximated, close his eyes. The nystagmus being in the horizontal plane, the reaction movement should be, not falling, but gradual turning in the horizontal plane to the right (Fig. 6).

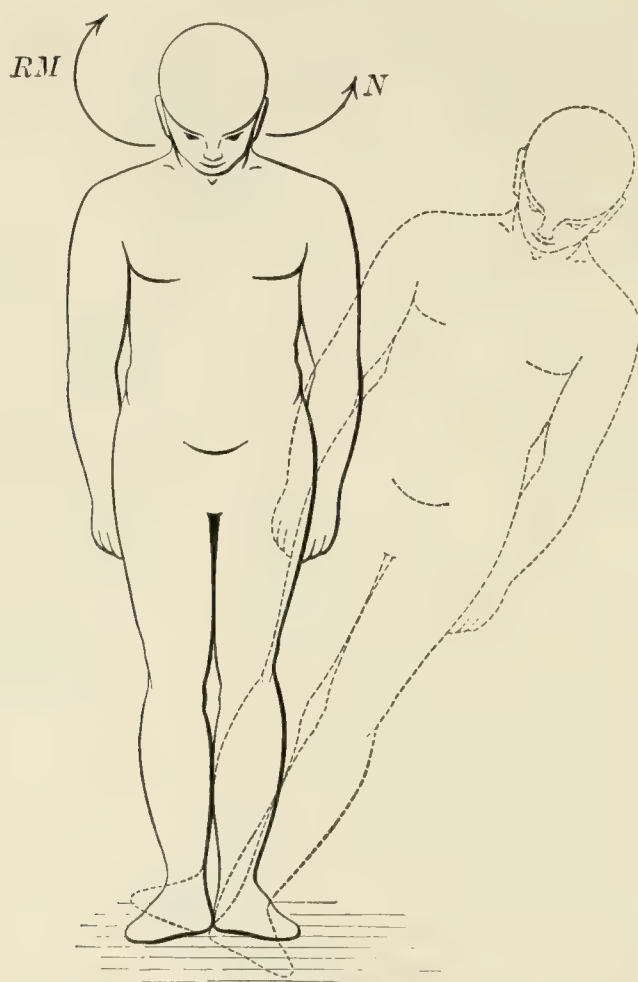


FIG. 7.—*N*, direction and plane of nystagmus; *RM*, reaction movement (*i. e.*, direction and plane in which body tends to move).

“This, however, may not be demonstrated, *i. e.*, he may stand quietly. Let us investigate the first rule, which declares that vestibular ataxia must be influenced by the position of the head. Direct him to bend the head forward to an angle of 90 degrees, so that his face looks directly downward. The plane of the nystagmus is now changed from the horizontal to the vertical, and the nystagmus being to the left, the head tends to rotate in the opposite direction, *i. e.*, toward the right shoulder. This, however, throws his body to the left. That this contradiction to the

rule that the patient usually falls or moves in the direction opposite to the nystagmic movement is apparent rather than real is made clear by the accompanying diagram (Fig. 7). If he had bent his head directly backward to an angle of 90 degrees, instead of forward, he would inevitably have fallen in the opposite direction, as shown by Fig. 8.

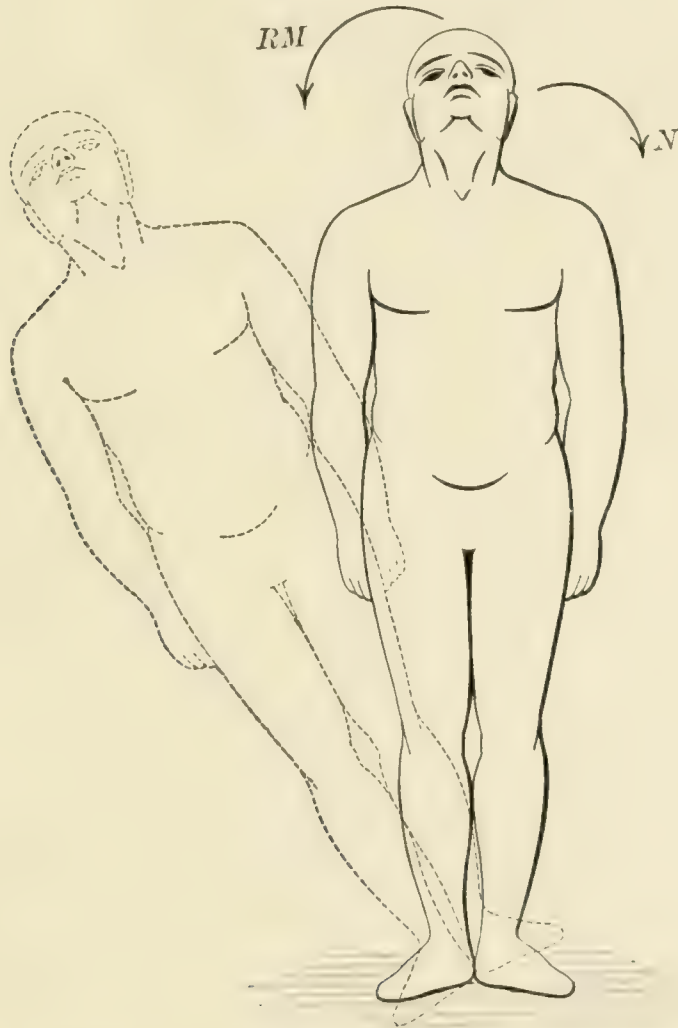


FIG. 8.—*N*, direction and plane of nystagmus; *RM*, reaction movement (*i. e.*, direction and plane in which the body tends to move).

“Another example may be cited in the rotary nystagmus following the caloric tests, or that occurring in acute labyrinthitis. Here the plane of the nystagmus being vertical rather than horizontal, the patient, standing with head erect, falls in the direction opposite to the quick eye movement; and, since in suppurative labyrinthitis the nystagmus is practically always toward the sound ear, it is perfectly correct to say that he falls usually in the direction of the diseased ear. It must not be forgotten, however, that in certain forms of circumscribed irritative labyrinthitis the nystagmus is in the direction of the diseased ear, in which case the patient would, of course, fall, or tend to fall, in the direction of the sound ear.”

Concerning the contention of Bárány that "vestibular vertigo and vestibular ataxia are invariably accompanied by some degree of vestibular nystagmus," Kerrison attaches to it great clinical importance, and in the phenomena induced by the rotation and caloric tests this contention had been substantiated. In his experience these experiments had, in normal persons, been invariably accompanied by vertigo and ataxia, usually pronounced, and by nystagmus; and in no case had the vertigo and ataxia been found to persist after the nystagmus has disappeared. He had personally never seen a case of labyrinthine disease in which vertigo and ataxia had persisted after disappearance of the nystagmus.

He called attention to the apparent contradictions one might meet with in any law dealing with subjective symptoms (*e. g.*, vertigo), or with objective symptoms which might be under the unconscious influence of the will (*e. g.*, disturbed equilibrium), in cases of hysteria or neurasthenia with a concomitant aural disease. "It is now an established fact that many neurasthenic patients exhibit under certain conditions certain peculiar uncontrollable eye movements, which are not of vestibular origin and in no way resemble vestibular nystagmus. In like manner, it is obvious that vertigo and apparent disturbance of the equilibrium may in neurasthenic patients depend wholly upon the functional disorder of the general nervous system."

Remembering the elaborate tests of von Stein, which were referred to in PROGRESSIVE MEDICINE of last year, Kerrison's comparison of their value with those of Bárány is of great interest. He says:

"The far-reaching influence which Bárány's theories, if accepted, must exert upon our conception of labyrinthine disease is emphasized when we consider their points of divergence from the theory and practice of von Stein. Bárány holds that disturbance of equilibrium is characteristic only of the acute stage of labyrinthine disease, and that it regularly disappears as the lesion advances, either toward resolution or toward destruction of the vestibular structures. This view is supported by the fact that vestibular ataxia as a subjective symptom rapidly disappears after the surgical destruction of the labyrinth. Bárány, therefore, attaches little importance to disturbed equilibrium as a diagnostic sign in the latent or chronic stage of suppurative labyrinthitis.

"Von Stein has elaborated exhaustive methods of eliciting symptoms of disturbed equilibrium, requiring, according to his own statement, one or even three hours for the thorough examination of a single patient. Since such an examination would be quite impossible in the acute stage of suppurative labyrinthitis, it is quite clear that von Stein regards his tests as appropriate to the later, or chronic, stage of the disease. Bárány believes that in the chronic stage of suppurative labyrinthitis the vestibular apparatus, in the great majority of cases, is no longer

responsive to the usual stimuli (*i. e.*, that its function is abolished), and that it is therefore illogical to expect disturbance of equilibrium as a result of disease localized in an organ which is not essential to static or dynamic equilibrium, and which, moreover, is no longer irritable.

“Von Stein apparently believes that at no stage of suppurative labyrinthitis are disturbances of equilibrium absent; and that while these disturbances may not interfere with the patient’s ability to walk or stand normally, they may be clearly demonstrated by requiring him to perform certain acts in which he is not practised by daily custom—*e. g.*, jumping or hopping with eyes closed, standing alternately on one foot and the other foot, standing on an inclined plane, etc.

“A possible source of error in all such tests lies in the fact that different individuals—depending perhaps on differences of age, muscular strength, general physical condition, or, if you please, upon physiological variations in the mental power of static or dynamic control—may, when called upon to perform any unusual muscular feat, exhibit apparent disturbances of equilibrium which cannot properly be referred to any organic lesion.

“It is now generally conceded that vestibular ataxia is a symptom induced by vestibular irritation, acting either upon the diseased labyrinth or by ablation of its function through disturbed balance of the unopposed healthy organ; and, further, that it rapidly disappears as a subjective symptom after the diseased labyrinth has been destroyed surgically, or its function (*i. e.*, irritability) completely annulled. If, therefore, von Stein’s tests elicit a veritable vestibular ataxia in the chronic stage of labyrinthine suppuration, we must assume that it is due not to irritation of the diseased and non-functioning labyrinth, but to excitation of the sound labyrinth which is no longer balanced by an opposed healthy organ. But if von Stein’s tests give positive results only by reason of ablation of function in the diseased labyrinth, why should we resort to so uncertain and exhausting an examination when far more definite data may be obtained by so simple a procedure as the caloric test?”

INDICATIONS FOR OPERATION IN LABYRINTHINE DISEASE. The advisability of operative interference in labyrinthine disease is still questionable in certain acute cases, while in chronic or latent cases the tests of labyrinthine function (vestibule and semicircular canals, and cochlea) have made the indications fairly definite. As far back as 1907 Neumann reported his experience in 52 cases before the German Otological Society of Bremen,¹ and the indications laid down are still looked upon as correct in principle.

From a clinical standpoint he divided purulent inflammations of the labyrinth into the following classes:

¹ Annals of Otology, Rhinology, and Laryngology, December, 1907.

1. Diffuse and circumscribed.
2. Manifest and latent.

Individual indications were tabulated as follows:

1. Cases in which *hearing and vestibular functions are intact*, and the radical operation shows the *presence of a fistula*. The labyrinthine functions being present, the defect in the labyrinth wall cannot be looked upon as a true fistula. The appearance of spontaneous nystagmus would be attributed to irritation of the vestibular apparatus from hyperemia or increased pressure. *Opening of the labyrinth is contra-indicated*.

2. Cases in which hearing is lost, *vestibular apparatus functioning (irritable)*; and the radical operation shows the *presence of a fistula*. Spontaneous nystagmus would indicate a circumscribed purulent lesion of the vestibule.

Opening of the labyrinth is indicated when there is spontaneous nystagmus together with increasing temperature and meningeal symptoms. It is *contra-indicated* if there is absence of spontaneous nystagmus or normal temperature.

3. Cases in which *hearing is present; vestibular apparatus does not react*, and the radical operation reveals a *fistula*. The indication is undoubted circumscribed purulent disease of the semicircular canals, and the *labyrinth operation is indicated* in the presence of the other accompanying symptoms, especially increasing fever. The presence or absence of spontaneous nystagmus should not be considered in reference to operation.

4. Cases in which *hearing is present; vestibular apparatus does not react*, and no labyrinthine fistula is found at the radical operation. The symptoms indicate purulent disease of the labyrinth, and, especially if there is increasing temperature, opening of the labyrinth immediately after the radical operation is indicated. This applies also to those cases, where the radical operation reveals other complications, like deep-seated extradural abscess, or cerebellar abscess.

5. Cases in which *hearing power and vestibular function are both destroyed; fistula in the labyrinth capsule*. These symptoms point to the presence of a diffuse purulent inflammation of the labyrinth, and, *without regard to the presence or absence of spontaneous nystagmus, opening of the labyrinth is absolutely indicated*.

6. Cases in which *hearing and vestibular function are absent; no labyrinth fistula*. The appearance of spontaneous nystagmus would indicate the presence of a diffuse purulent labyrinthitis, without a macroscopically visible fistula. In such a case one-sided *opening of the labyrinth is absolutely indicated*. Absence of spontaneous nystagmus indicates a latent diffuse purulent labyrinthitis. In such a case the labyrinth operation is to be considered only in the presence of fever, meningeal symptoms, or other peculiar circumstances.

7. Cases in which *hearing is absent; vestibular apparatus normal; no labyrinth fistula*. In such cases *opening the labyrinth is contraindicated* even if spontaneous nystagmus is present.

Bárány presents the following *indications for operation*: "We are bound to operate on the labyrinth in every case of severe infection, unless, the general state of the patient is unfavorable, especially since the operation is not particularly dangerous. (1) *In acute suppuration of the labyrinth*. (a) If there is fever, headache, foul secretion, pains in the mastoid, or periosteal abscess, the complete operation on the mastoid and on the labyrinth must be performed forthwith. (b) If fulminating symptoms are absent, we may, as in appendicitis, either proceed to operate on the labyrinth at once, or wait for from five to ten days (or until we suppose a satisfactory barrier has had time to form between the diseased area and the intracranium). (2) *In latent diffuse suppuration of the labyrinth* the labyrinth operation must be performed at the same time as the mastoid operation, for this is the condition in which postoperative meningitis is most likely to occur. (3) *In circumscribed suppuration of the labyrinth* a decision is not so easily arrived at as in the foregoing. The reason is, that in circumscribed cases the radical mastoid operation is often followed by healing and closure of the fistula. In many patients the vertigo will soon disappear, but in others it will continue for years, sometimes quite trifling in character, at other times so severe as to incapacitate the patient for work. In a minority of cases the disease spreads and a diffuse labyrinthitis ensues. In that event, of course, the case passes into Class 1, and immediate operation of the labyrinth is imperative. This danger and the possibility of vertigo continuing after cure of the fistula render it, therefore, advisable to perform a complete operation whenever possible. In coming to a decision, the state of the hearing power should be taken into consideration. If the hearing in the affected ear is bad, the complete operation is to be preferred. If it is good, or if the hearing in the other ear is poor, then it is preferable to avoid interfering with the labyrinth in any way. These conditions apply, of course, only to a circumscribed suppuration."

He summarizes the varieties and symptoms of circumscribed lesions of the vestibular tract as follows:¹ "(1) *Caries of the outer wall (fistula) with normal labyrinthine excitability*. Spontaneous nystagmus may be absent or present. If present, it is moderate, rotary, and horizontal in character, and directed both to the right and the left. In 50 per cent. of cases an attack of vertigo with nystagmus to one side can be induced by inclining the head backward. The pressure reaction is positive. The caloric test on the affected side shows a typical reaction,

¹ Physiologie und Pathologie des Bogengang-Apparates beim Menschen, Bárány; McKenzie, The Journal of Laryngology, Rhinology, and Otology, February, 1909.

or a reaction more strongly marked than the normal. Rotation tests give normal reactions.

"2. *Caries, or fistula of the outer wall, with a lowered labyrinthine excitability.* Spontaneous nystagmus is moderately marked; as a rule, it is stronger to the affected side. In 50 per cent. of cases backward inclination of the head causes vertigo and nystagmus. Pressure test shows very slight eye movements and no nystagmus. Caloric test on the affected side gives a slight reaction; on the sound side, a normal reaction. The rotation tests show the same results as in latent destruction of the labyrinth.

"3. *Traumatic cases with neuroses and circumscribed disease of the vestibular apparatus.* The caloric tests are normal on both sides, and the reaction is combined with violent vertigo, nausea, and sometimes vomiting."

FISTULA SYMPTOM IN PURULENT LABYRINTHITIS. Close attention is now given to the so-called fistula symptom in all purulent cases, and careful investigation often leads to accurate diagnosis previous to operation.

It is interesting to note that Moure and Cauzard, who in an excellent article on "The Functional Examination of the Labyrinth,"¹ while they substantiate all of Bárány's work in other respects, "attach no importance to pressure nystagmus," claiming that, "on the one hand, it may be absent in cases of fistula, and on the other, it may be obtained in cases in which there is no labyrinthine lesion."

Nevertheless, it seems probable that Bárány's investigations are correct, and histories of labyrinthine investigation now usually contain the record of the presence or absence of the fistula symptom. In a paper entitled "The Clinical and Pathologico-Histologic Contribution to the Question of Labyrinth Fistula," Ruttin² says: "The diagnosis of 'labyrinth fistula' for a long while could only be made *intra operationem* or else on a specimen. This is true today in those cases in which it is found that the function of the labyrinth is destroyed at the time of examination. In the majority of cases, however, where the labyrinth function is preserved, wholly or in part, we are now able to make a clinical diagnosis of labyrinth fistula by the simple method of the recognition of the 'fistula symptom.' " He then calls attention to the fact that Lucae, Herzfeld, Kipp, Jansen, and Gradenigo were the first to notice this symptom, and that it was advanced by Bárány, Neumann, and Alexander. To Bárány and himself belong the credit of reporting the first cases, in which the recognition of the "fistula symptom" had indicated operation. He describes the fistula symptom as consisting in "associated movements of both eyes of definite and

¹ The Rapport or introduction to the Discussion on this subject at the Congress of the French Society of Laryngology, Otology, etc., Paris, May, 1909.

² Monatschrift f. Ohrenheilkunde, etc., 1909, yr. Heft, 2, XLIII.

opposite type, with compression and aspiration of the air in the external auditory canal." The kind and intensity of the movement is variable, and is to be judged in conjunction with the results of the functional test. Bárány, in his work, *Physiologie und Pathologie des Bogengang-Apparates beim Menschen*, describes *nystagmus from condensation and rarefaction* of the air in the meatus (the pressure test) as being obtained only in cases where there is caries or fistula in the external wall of the labyrinth, drawing an analogy between this and the nystagmus which took place in the experiments of Ewald. The test is carried out by means of a Siegle speculum fitted closely in the meatus. Condensation and rarefaction of the air in the meatotympanic cavity is accompanied by slow and extensive ocular movements, as well as a quick nystagmus of several seconds' duration, in cases where there is a breach in the external labyrinthine wall and the vestibular apparatus is intact.

This pressure test has been found of value chiefly as a supplement to the caloric test. When the function of the labyrinth has been interfered with by disease so that the caloric test produces no reaction, or a very slight one, it has been found that the pressure test also produces very slight nystagmus. If the pressure test brings out slight nystagmoid movements in a case in which there is a normal caloric reaction, a diagnosis of fistula cannot be made. If, however, the reaction to pressure is very positive, while there is a negative caloric reaction, the presence of a fistula is positively indicated. While the nystagmoid movements resulting from condensation and rarefaction may vary in direction, they are in the same case always in opposite directions, and this, according to Bárány, is the positive indication of the presence of a fistula. In the paper by Ruttin just mentioned, the details of 16 cases are reported. Case 16 came to autopsy, and the histological findings were shown in numerous plates. This is the first reported case in which the fistula symptom was noticed, its disappearance observed, and the cause of the phenomena demonstrated histologically.

Often the site of a fistula can be determined during the operation. Literature, up to the present time, shows the horizontal semicircular canal as the most frequent seat of the affection. Ruttin believes that this has resulted from the fact that the horizontal semicircular canals are most readily seen. The defects at other points give a comparatively poor prognosis. In 33 cases of purulent labyrinthitis the fistula was found 20 times at the horizontal semicircular canal only; once at the horizontal and superior, once at the horizontal and posterior, once at the oval window, and in 9 cases no fistula could be found during the operation. Sixteen of these cases had the vestibular apparatus only partially destroyed, and in the presence of the caloric irritability and the fistula symptom they were divided as follows: 12 cases had fistula symptom and caloric reaction; 2 had fistula symptom and showed no caloric reaction; 1 had no fistula symptom, but a fistula was dis-

covered and a caloric reaction was present; and in 1 case the fistula symptom was not looked for, yet a fistula was found with a caloric reaction. In all cases but one a fistula was found; in 14 cases it was found in the horizontal semicircular; in 1 case in the promontory. In 17 cases a fistula of the labyrinth was found at operation, in which the functional examination showed a destruction of the labyrinth. Among these cases the fistula was found in the horizontal semicirculars four times; in the horizontal and superior in 1 case, in the horizontal and posterior in 1 case, and in the promontory in 1 case. In 9 cases there was no fistula found at the operation. Ruttin points out that these figures seem to indicate the localization of fistulæ in the horizontal semicircular crest, since in the greater number of the cases the presence of the fistula symptom and the caloric irritability of the vestibular apparatus was followed by the location of the fistula on operation at that point.

Types of Fistula Symptoms. The fistula situated in the horizontal semicircular canal gives a particular type of fistula symptom; it consists, as Bárány describes it, as a rule, in a slow movement of both eyes to the opposite side on compression of the air in the external auditory canal, and in a similar movement toward the aspirated side on suction. In some of the cases the slow movement is followed by a small, quick, backward movement, and in other cases compression and aspiration bring about a rhythmic concentric movement of both eyes. In one case the nystagmus was reversed after a few days. Bárány explained this by assuming that the ampulla of the semicircular canal may have been filled with a thicker exudate, and that the impetus was propelled through the smooth end. One of the author's cases seemed to substantiate this histologically. In the one case where the fistula was at the promontory the typical fistula symptom was observed, and it was thought at the time of examination that the fistula was at the horizontal semicircular canal. Where the fistula symptom disappeared, we may surmise that the pus may have penetrated into the utricle. That the vestibular apparatus has great power of resistance, explains the many cases of long-continued purulent otitis, showing a persistent fistula symptom. In some cases, hearing remains intact in the presence of a fistula symptom.

In conclusion Ruttin says: "What histological changes may we expect when we can prove clinically the fistula symptom. We may expect that a fistula of the perilymphatic space exists with a perforated endostium; however, we cannot go far wrong when we assume also that a fistula symptom may be caused when the disease has reached only to the endosteum but has not perforated it. Therefore, with the fistula symptom proved clinically, we may assume that a penetrating defect of the bony labyrinth capsule exists, even if we cannot find it at the operation, since a defect of the rest of the labyrinth wall is harder to demonstrate than one at the semicircular crest."

At the meeting of the Austrian Otological Society June 22, 1908, Bárány¹ presented a patient who was operated on for chronic purulent discharge and labyrinth fistula. This case was of particular interest, because the patient was examined clinically before the formation of the fistula; she showed caloric reactions fifteen seconds after irrigation with 30° C. warm water, which lasted two and one-quarter minutes. In the healthy ear the nystagmus began after ten seconds and lasted three minutes. The rotary nystagmus to the diseased side lasted fifty-five seconds after ten rotations; the rotary nystagmus to the healthy side, forty seconds after ten rotations. Fistula symptom negative. Speech heard, and whisper heard one meter.

Eight days later the patient returned complaining of dizziness, which began suddenly three days before while walking. Upon rapid head movements, and in bending forward, or bending the head backward, a nystagmus to the diseased side took place. No spontaneous nystagmus; slight changeable nystagmus to the diseased or healthy side. The examination for fistula symptom showed with air condensation a decided nystagmus to the diseased side; and with air rarefaction, a lesser nystagmus to the healthy side. The caloric examination showed a nystagmus beginning after fifteen seconds with warm water at 30° C., lasting three minutes; in the healthy ear it began after fifteen seconds, and lasted two and three-quarter minutes. The duration of rotary nystagmus was forty seconds to the diseased side, forty-five seconds to the healthy side. Fistula symptom as before. Hearing as before. At operation a fistula of the semicircular canal was found. After operation a nystagmus took place to the healthy side. Hearing was abolished, and the irritability of the vestibular apparatus was noticeably diminished.

This case is of much interest, because it was the first in which an exact functional examination of the cochlear and vestibular apparatuses was made before the spontaneous advent of the fistula. This case illustrates the fact that through the formation of a fistula an abnormal irritability of the vestibular apparatus takes place, which shows itself in the vertiginous attacks (spontaneous and with head movements), but that an unusual irritability of the vestibular apparatus, as Alexander contends, does not exist, since the numbers, as advanced by Dr. Kiproff, agree entirely with the average numbers of anatomically similar middle-ear suppurations. Bárány doubts very much if there is a real physiological superirritability of the vestibular apparatus that answers to physiological stimulus with increased function.

In connection with this case, Barany reports his experiences with fistula symptoms in the clinic of Professor Urbantschitsch. One hundred and sixty patients were examined for fistula symptom. Of

¹ Archiv f. Ohrenheilkunde, etc., 1908, Heft 10.

these, 145 cases showed no fistula symptom, and in none of them was a fistula found on operation. All these cases showed also a typical caloric irritability. In 4 cases in which no fistula symptom was found, the caloric irritability was negative. In all these cases a diagnosis of purulent labyrinthitis was made, and at operation a fistula was found and a labyrinth operation completed. In 11 cases a fistula symptom was found before operation; of these, 9 have been operated, all of which had a fistula of the semicircular canal. Six cases showed a marked fistula symptom, *i. e.*, well-marked nystagmus, with air condensation as well as air rarefaction. The caloric irritability was normal in these cases. In some cases the hearing was preserved, and in others, there was deafness. In 3 cases the fistula symptom was very slight. In place of the nystagmus only very small and slow rotations of the globe were noticed, always, though, with air rarefaction, the opposite to air condensation. In these cases the caloric irritability was either markedly diminished or else wanting, and there was deafness. Bárány says that in his experience the fistula symptom has been entirely trustworthy, in most cases the nystagmus being directed to the diseased side on air condensation, in the fistulæ of the semicircular canal, although he has seen exceptions to this.

Alexander and Lasalle¹ and Mackenzie² have written on *labyrinthine nystagmus*, and in the latter's paper a number of the cases of Alexander are printed anew, to which are added two other cases. In all these cases Alexander had apparently found a positive fistula symptom, but on operation no fistula. In discussing these, Bárány says that they can all be arranged into three groups: (1) Those in which from the history, (2) those in which from the description, (3) those in which from the operative course, it may be seen that a stapes fistula, or a fistula of the round window in all probability, was the condition present. He then details these recounted histories, and points out the reasons for his conclusions. In all these cases, since Alexander found no semicircular fistula, we must assume a stapes fistula. At any rate, the contrary view cannot be proved. There are still cases left in which Alexander got rotary nystagmus to the healthy side by air condensation. In one operated case there was no dizziness either before or after operation. In two cases in which perforation had healed, there was no compression nystagmus after closure. Bárány thinks that he had to do with a caloric reaction in these cases because repeated air blown into the external auditory canal, and in exceptional cases the blowing of air into the tube by catheterization, causes a caloric nystagmus.

Finally, Bárány mentioned a case of Liedler in which the fistula symptom was mistaken for the associated nystagmus of Strausky.

¹ Wiener klinische Rundsch., January, 1908, XXII Jahrgang, No. 142.

² Monatsschrift f. Ohrenheilkunde, April, 1908.

In this case Liedler incised the dura. "He did not mention any compression nystagmus. In the history sent to me he says that a compression nystagmus was noticed in both ears. I had occasion to examine this case two or three days before admission to the Polyclinic, and could easily demonstrate the Strausky associated nystagmus. This could easily be mistaken for the fistula symptom. In this case, not only with air condensation and rarefaction, but also with pressure on the mastoid process, or on the tragus, and also on closing the eyes, without any further stimulus, a well-marked oscillating nystagmus with simultaneous movement of the lids took place. That this mistaken interpretation could happen to so practical an observer as Liedler shows how difficult exact and sure observations are." Bárány calls attention to the fact that in Alexander's cases nystagmus due to compression only is mostly spoken of, and says, "*According to my mind, a fistula can only be diagnosticated when with compression nystagmus or vestibular eye movements in one direction the nystagmus takes place in the opposite direction upon aspiration.*" He calls attention to the fact that the aspiration should immediately follow the compression, without removal of the olive point of the Siegle otoscope from the ear, because the compression presses the movable parts of the labyrinth fistula into the interior of the labyrinth, and produces in this way an endolymph movement. If aspiration is at once practised, the opposite endolymph movement occurs, and the soft parts of the labyrinth fistula are sucked into the original position or still more outward. If, however, the olive tip of the bulb is removed, the soft parts of the labyrinth fistula return gradually into their original place spontaneously, and then, with the belated aspiration, more force must be used to produce an endolymph movement. He also cautions that with the Gellé method care must be exercised to keep the external auditory canal air-tight, to avoid a caloric nystagmus, if the experiment is often repeated.

Bárány severely criticises Jansen's paper before the American Laryngological, Rhinological, and Otological Society, at Pittsburg, May 28, 29, and 30, 1908, on account of the methods of examination of his cases. While he has used the caloric test for the past year, he seems to have paid no attention to the fistula symptom, and has therefore made very poor use of his clinical material. He calls attention to the fact that stapes luxation plays a large part in his reported cases. The description of these cases can be compared to "the serous labyrinthitis" of Alexander and Voss. In these cases the nystagmus and vertigo do not seem to occur at once with the injury, but twelve to twenty-four hours after, or even later. Jansen observed 19 cases, of which, only 2 were healed without a labyrinth operation. The stapes luxation occurred only six times during the radical operation; twelve times during the after-treatment, especially during the curettage. Thirteen cases were operated upon; 9 cured. In Alexander and Voss'

cases all were cured. Bárány believes with Jansen that a caloric reaction is still probably intact the first or second day, and cannot therefore be relied upon as a test of purulent labyrinthitis. He then says: "*I believe that to differentiate the cases of stapes luxation from the cases of serous labyrinthitis, the test for fistula symptom must be undertaken, whether it be with a sterile rubber cap applied over the whole wound region air-tight, or with a cotton applicator gently applied to the stapes region. If there was no fistula symptom before the operation, and if now a fistula symptom be proved, with retained or diminished caloric irritability, we have to do not with a serous labyrinthitis, but with a stapes luxation. If the fistula symptom is wanting, with a retained caloric irritability, we can diagnosticate a serous labyrinthitis.*" From the practical standpoint this diagnosis is important. If we can diagnosticate a serous labyrinthitis with retained caloric irritability, we must leave the labyrinth alone; but if we diagnosticate a stapes luxation, we must at once do a labyrinth operation. A serous labyrinthitis that has caused the destruction of the hearing and a non-irritability of the vestibular apparatus cannot be differentiated from a purulent labyrinthitis with the same functional findings. The patient's interest would be best served in these cases if we do a labyrinth operation.

Neumann, in discussion of the subject, thinks he can differentiate a serous from a purulent labyrinthitis by examining the hearing. Where the hearing for speech is gone, if the forks are heard by air or bone conduction on the diseased side, he makes a diagnosis of serous labyrinthitis. Bárány, in answering, said that the retained hearing quality proves nothing against labyrinthitis in its beginning stages, as a case observed by Neumann and himself taught, and which Neumann doubtless did not at the moment recall. It concerned a case in which after the extraction of the malleus and incus an acute labyrinthitis and meningitis developed, and the patient died in two days. During the first day this patient heard speech at six meters, which was followed by a total deafness after twelve hours. Examinations with the noise apparatus had convinced Bárány that the hearing of the forks on the mastoid process of the diseased side, in one-sided deafness, is only an imaginary hearing, since with the noise apparatus applied to the healthy side even the strongest vibrations of a fork applied to the mastoid of the diseased side was not heard.

INTRACRANIAL LESIONS OF THE VESTIBULAR TRACT have been carefully considered in Bárány's *Physiologie und Pathologie des Bogengang-Apparates beim Menschen*. In an analytical review of this work by Mackenzie,¹ with reference to this phase of the subject, he says: "As has been said, vertigo and nystagmus can be induced by a lesion of the vestibular nerve within the cranium, as well as by

¹ The Journal of Laryngology, Rhinology, and Otology, February, 1909.

a lesion of the end organ, and the differential diagnosis between the two depends upon the presence or absence of cochlear phenomena. Later, the association of other cranial nerve paralyses renders diagnosis easy, so long, that is, as the excitability of the vestibular apparatus remains normal. In cases where the labyrinthine excitability has been lost, a correct diagnosis may still be made by observing the nature of the spontaneous nystagmus present. When, for example, the right labyrinth no longer responds to the usual test, and marked rotary¹ nystagmus to the right is present, then we argue that there is some intracranial lesion in existence, for the following reasons: Nystagmus to the right is due to irritation of the right vestibular tract. If the tests show that the one labyrinth has lost its irritability and that the other is normal, then the lesion must necessarily lie in the intracranium, where it can exercise an influence upon the vestibular nerve trunk or nucleus. Further, if the nystagmus is arising from irritation of the active labyrinth, it will lessen in intensity as time goes on, whereas, if the cause is intracranial, the nystagmus will go on increasing. If, for example, it is found that after a complete labyrinth operation the nystagmus continues to increase, then there must be an intracranial lesion. In chronic suppuration of the middle ear the lesion responsible is usually postbasal meningitis or cerebellar abscess. In the absence of middle-ear disease, a lowering of labyrinthine irritability, with nystagmus to the sound side, denotes a tumor affecting the auditory nerve.

"As a result of further observations on intracranial diseases affecting the vestibular system, Bárány states that the ocular signs and symptoms may be grouped in three classes, each corresponding to a different lesion. These are: (1) When voluntary power over the optic muscles is lost and all nystagmus is absent, corresponding to a lesion in the medullary nucleus. (2) When there is loss of voluntary power over the ocular muscles, with loss of the rapid phase of nystagmus, but with a slow phase present, corresponding to a lesion above the nucleus. (3) When voluntary power over the ocular muscles is lost and vestibular nystagmus is complete and unimpaired, corresponding to a lesion in the angular gyrus."

Bacteremia in Suppurative Otitis. In PROGRESSIVE MEDICINE for last year attention was directed to this subject as a result of some interesting work carried out at the Mount Sinai Hospital by Libman and Gruening. It will be remembered that, as a result of his investigations, Libman had expressed the belief that in a case of suppurative otitis in which there was no active purulent focus elsewhere (like pyelonephritis, peritonitis, etc.) the presence of a bacteremia was sufficient evidence of septic lateral sinus thrombosis to justify immediate operative interference, even in cases where other definite clinical manifestations

¹Rotary nystagmus must not be confounded with rotation nystagmus.

were absent. Realizing the immense advantage of this comparatively easy method of diagnosis in doubtful cases (where statistics have proved that operative interference, when adopted within the first week, has saved twice as many patients as when adopted after that time), Jonathan Wright and I attempted to substantiate or disprove this position with the large material offered by the Manhattan Eye, Ear, and Throat Hospital.

The result was most interesting, and the paper on the subject, presented at the Meeting of the American Otological Society,¹ June 1 and 2, 1909, evoked an active discussion. In all, from February 27, 1909, to March 15, 1909, cultures were made from 57 patients, 55 ear cases from the clinics of Berens, Phillips, Duel, McKernon, and 2 frontal sinus cases from the clinics of Chappell and Coffin. In some of the positive cases one or two repeated cultures were made to confirm the first. Owing to the difficulties in making them, cultures in infants and small children were not attempted. At first, only cases just operated on, or about to be operated on, for mastoiditis were examined. Later on, cases of acute otitis, in which symptoms cleared up rapidly after myringotomy, were investigated.

In 42 of these cases the following technique was adopted by Miss Gignoux, who did all the laboratory work: Ten c.c. of blood drawn with a sterile syringe, or "mosquito," from the median vein was transferred to the Erlenmeyer flask, containing 150 c.c. of broth (either plain broth or 1 per cent. dextrose), and was then incubated for thirty-six hours. It was then thoroughly shaken, its neck well cleaned off, and 15 c.c. of its contents poured out into a previously sterilized centrifuge tube. This tube full of blood broth was then immediately centrifuged for fifteen or twenty minutes, the supernatant fluid was then poured off, and agar slants were inoculated from the sediment. This inoculation should be made with a stiff platinum loop, and plenty of the blood corpuscles at the very bottom of the tube should be picked up and carried on to the agar. In 42 cases investigated by this method, 15 positive cases of bacteremia were demonstrated. In a second series of 15 cases the blood was mixed with an oxalate of ammonium solution, to prevent coagulation, and immediately plated. By this method one positive case was demonstrated. The clinical histories of the positive cases were given.

We were thus able to demonstrate a positive bacteremia in 16 cases out of 57 examined. Four cases had definite clinical signs of septic sinus thrombosis, for which jugular ligation and excision and opening of the sigmoid sinus was performed—2 with demonstration of clot, 2 without, on account of violent hemorrhage; recovery in all. One case had acute suppurative labyrinthitis and diffuse leptomeningitis;

¹ Transactions of the American Otological Society, vol. xi, part 2; and New York Medical Journal, October 30, 1909.

1 case had acute purulent otitis without mastoid involvement; 2 cases from the throat clinic had frontal sinusitis, 1 of which was complicated by meningitis.

The remaining 9 cases were those of mastoiditis, without complications, each of which ran an uneventful course after operation. Streptococci were present in 14 of the cases, pneumococci in 2.

It is significant that streptococcemia was present in all of the cases presenting clinical symptoms of sinus thrombosis, and in the case of diffuse leptomeningitis; however, it is none the less significant, from another point of view, that in 9 cases, without any alarming symptoms of further complications, 7 had streptococci and 2 pneumococci in the blood. It seems perfectly evident that a bacteremia occurring in the course of a purulent otitis can by no means be considered sufficient cause for invasion of the sinus in the absence of other definite clinical symptoms. The fact that Libman found a bacteremia in 7 out of 10 of Gruening's cases, and that we found it in all cases in which the clinical symptoms were pathognomonic of sinus thrombosis, would seem to make it a valuable additional sign in connection with other definite clinical symptoms.

A review of the histories and charts of the 41 cases of mastoiditis in our series, in which blood cultures were negative, reveals the interesting fact that many of them showed vacillating temperatures and passed through a much stormier course subsequent to operation than the 9 cases which showed a bacteremia without other symptoms. Wright, in remarking upon the facts which I have adduced from our work in the laboratory, adds: The technique of inoculating broth with 10 c.c. of blood and incubating it for two or three days, and then centrifuging it, is one which has proved very efficacious in demonstrating that in a large proportion of cases with trifling symptoms of otitis there is, at least in these cases (nearly 30 per cent.), one or more streptococci in 10 c.c. of the patient's blood. As this quantity of blood is only something like a thousandth part of all the blood, it naturally follows that the proportion of cases actually having bacteremia must be much higher than our figures indicate. That Miss Gignoux made no mistake in the basis which she offers for this view seems probable, since, aside from the care she exercised in the technique, a certain number of the cases were examined more than once, and the same organism, so far as we could judge, was found each time. Where smears from the mastoid were compared with the culture results, there was a significant coincidence.

We were able, through the courtesy of Dr. McKernon, to report 4 other positive cases of bacteremia in simple mastoiditis, in which there was no clinical evidence of sinus involvement. Recovery was uneventful in all. At least, we have proved that a bacteremia does exist in such mild cases. Naturally, all its limitations have not yet been investigated.

The subject is still under investigation at the laboratory of the Manhattan Eye, Ear, and Throat Hospital, and I have no doubt that another year will bring out important conclusions regarding it.

Lateral Sinus Thrombosis. At the meeting of the New York Academy of Medicine, December 10, 1909, Dr. Crockett, of Boston, awakened great interest in the subject of lateral sinus and jugular bulb thrombosis by a vigorous paper in which he advocated a very early operation in cases of otitis or mastoiditis where vacillations of temperature, chills, or chilly sensations gave evidence of systemic invasion. He reported the results of 60 cases operated upon by different surgeons in the Massachusetts Charitable Eye and Ear Infirmary during the past five years, and attributed the excellent statistics in the first place to the early operation, and in the second to the method employed. The latter differed radically from that usually employed, in that the jugular vein was ligated just below the facial, previous to incision of the sinus; and in that it was not excised. Leaving out cases in which there were accompanying intracranial lesions, which in themselves were fatal, the results showed only 2 deaths in 52 operated cases.

The paper called forth a lively discussion by Gruening, Bacon, Whiting, Sheppard, Alderton, McKernon, Dench, Fridenberg, Kenefick, and myself. While there was a general recognition of the importance of early diagnosis and operative interference, there was a feeling on the part of many of those who took part in the discussion that the symptoms enumerated by Crockett were hardly sufficient in certain cases to warrant operation. This was particularly true in infants and young children in whom bronchopneumonia, a central pneumonia, or "la grippe" with very slight objective symptoms often exhibited regular and wide excursions of temperature quite similar to those manifested in septic sinus thrombosis.

In my discussion I called attention to a series of charts from the Babies' Hospital which I had presented at the New York Otological Society last winter. These showed almost identically similar vacillations in temperature in cases of la grippe, some with, some without, a complicating otitis. All had recovered without operation. Such instances as this render the diagnosis of sinus thrombosis from a "sawing" temperature in infants very uncertain, if not improbable.

There was considerable difference of opinion regarding the advisability, in a case of undoubted sinus thrombosis, of ligating the jugular vein before attempting removal of the clot. Crockett was most pronounced in favoring this procedure, and believed that failure to do this in two earlier cases (not included in the present series) had been responsible for a fatal issue. The majority of those who spoke to this point were in favor of ligating in those cases in which incision and curettage of the sinus failed to establish a free flow of blood from the proximal end. All had made a practice of ligation just above the clavicle, and

excision of the vein up to the region of the bulb, when undertaken at all.

Crockett, in closing the discussion, said that he believed the objection to leaving the vein in position after ligation was due to theoretical grounds rather than practical ones, and advised strongly that it should be tried before being too severely criticised.

I was much gratified with Crockett's report, with its unequalled statistics, inasmuch as it embodies certain principles in the treatment of septic sinus thrombosis with which I was thoroughly in accord. It has been well demonstrated that early operation, before too profound sepsis or metastatic foci have occurred, has made a difference of fully twice as many recoveries, regardless of the method employed.

It also seems probable that the important aim should be the elimination of these possibilities of general infection by cutting off the circulation at both ends of the infected area, rather than the removal of all the infection. It is impossible to remove all of the infected sinus wall at the site of the thrombus; therefore, why should the vein be dissected out from the clavicle to the jugular bulb in every case? Since the sinus wall is infected and cannot all be removed, why should one lose time and subject the patient to the loss of an immense amount of blood in trying to demonstrate the clot?

If a sufficient amount of the sinus wall is removed to afford drainage from the infected area the local poison will take care of itself, and the infection can be more carefully removed a day or two later, without the annoyance of hemorrhage. In the meantime, the patient has had time to adjust himself to the problem of taking care of a local instead of a general infection.

The factors of saving of time, saving the loss of blood, and diminution of surgical shock, add great weight to the advisability of this more conservative method of dealing with this desperate condition.

Syphilis in Relation to Diseases of the Ear. At the Academy of Medicine, on December 10, Dr. Edmund Prince Fowler read a very interesting paper on "The Serodiagnosis of Syphilis in Relation to Diseases of the Ear." As Fowler stated, he was most fortunate in being associated with Noguchi, of the Rockefeller Institute, so that all the laboratory work was done by the originator of the method, and although in no case was the serum to be tested accompanied by a diagnosis, the results of the tests tallied absolutely both with clinical histories and with former and repeated examinations of serum from the same patient.

The results were tabulated, and the paper fully brings out the most important facts, briefly summing up the findings. Of the 128 cases examined, 66 were children and 62 were adults. About 12 per cent. gave strongly positive reactions, and in one-third of these cases a positive syphilitic history was obtained.

Sixteen per cent. gave weakly positive reactions; one of these cases

was definitely syphilitic, but had been under treatment for a long time, and, as Noguchi has pointed out, was likely, therefore, to show the weak or negative reaction; 11 per cent. gave doubtful reactions, and 61 per cent. negative reactions. Of the latter, one case gave a history of syphilis, but repeated examinations failed to elicit a different result, probably because the case had been under treatment for several years.

Fowler called attention especially to the fact that the absence of a positive reaction does not absolutely disprove the existence of syphilis, but that the consensus of opinion is that the presence of a positive reaction is very strong evidence that the patient is infected with active luetic poisons.

Strongly positive reactions occurred in 10.6 per cent. of the children, and in females and males in the proportion of two to one.

Strongly positive reactions occurred in 13 per cent. of the adults, and, including the two women who were specific though not showing strongly positive reactions, the proportion between females and males was as two to three. In figuring the percentage, only the strongly positive reactions were considered, although it is fair to assume that many of the weak and doubtful reactions were actually in patients who had been syphilitic.

The cases examined by Fowler were all suffering from some ear disease, and, with one or two exceptions, harbored no other ailment at the time the tests were made; they are of unique interest therefore, from the standpoint of the reliability of the test, and the figures were quoted to show Noguchi's results in different diseases and in cases in which syphilis could be excluded. All these tended to convince us that the positive reactions were, in fact, in syphilitics, and that, as Fowler holds, the ear diseases in the cases must have been influenced in greater or less degree as to their inception and their chronicity by the syphilitic taint in their tissues.

The summary was briefly as follows: Syphilis is more frequently associated with diseases of the ear than clinical observation suggests; the reason for its non-recognition has been the lack of a reliable test for its detection, its denial by the patient or parents, and the failure on the part of the otologist to look for the disease.

In Noguchi's modification of the Wasserman reaction we possess a simple, inexpensive, and reliable test for positive syphilis.

In adults the greatest number of syphilitics is in cases of nerve deafness and chronic catarrhal otitis. In children with ear diseases the great majority of positive reactions occur in suppurative otitis. The presence of hypertrophied tonsils and adenoids seems to bear no relationship to the results of the complement fixation test. Marked benefit to the auditory apparatus and the general health generally follows anti-syphilitic treatment in cases giving a positive reaction.

Twelve per cent. of all diseases of the middle or inner ear give strongly

positive syphilitic reactions. Syphilitic affections of the inner ear would appear, as a rule, to be late manifestations of the disease.

Otosclerosis. Little of interest has been added to the question of otosclerosis. Zitowitsch,¹ of Vienna, has written an elaborate article on "The Treatment of Otosclerosis with the Faradic Current." He discusses the causation of otosclerosis, as advanced by the different authors, at great length, and himself adheres to the conclusion that disease of the inner ear muscles is the cause of the sclerosis, and for this reason he directs his treatment against the weakness and atrophy of these muscles. This, he claims, can best be accomplished by massage of the tensor tympani and stapedius muscle. The use of the catheter, Politzer bag, and vibromassage, however, are contra-indicated in these cases, inasmuch as they cause a hyperemia which would only increase that already existing. Therefore, the only remaining method, to his mind, consists in the electromassage of these muscles, which, he claims, does not change the blood supply in the middle ear, but is useful in causing contractions of the muscles.

His method consists in examining the nasopharynx and the hearing. By catheterization the contraction of the membrana tympani is noted. Faradization is begun only after the catheter and massage had failed. He always begins with treatment of the poorer ear, and if after four or five treatments this shows improvement, he begins with the other side as well. An electrode of copper wire, in the form of an ear catheter with a bullet end at the tip and a set screw at the other end, is used. The entire electrode, excepting the tip and set screw, is insulated with rubber. Professor Simanowski uses a thin wire copper electrode, which is inserted into an ordinary catheter, and so introduced through the nose. Zitowitsch always introduces the electrode as far as possible into the Eustachian tube, making use of the salpingoscope to be certain that the tip lies against the upper wall of the Eustachian tube over the course of the tensor tympani muscle. The other electrode is an ordinary sponge or leather electrode, which is moistened and placed in the angle between the mastoid and lower jaw. In this region we are over the motor point of the facial nerve, and in the region of the branches of the trigeminus nerve. Either a fluid faradic or a street current transformer is used. He employs the strongest current which the patient will bear without complaint. Applications of three to five minutes' duration, three times a week, are made.

He reports the examination, treatment, and result in twenty patients ranging in ages from seven years to sixty. Half of them had "primary sclerosis," the other half "secondary." All but three had tinnitus. All lost their tinnitus under faradic treatment, some cases after a few days, others only after two months. Hearing improved in all

¹ Monatsschrift f. Ohrenheilkunde, 1908, Heft 11.

cases. In all, only one case showed no improvement. The improvement seems to last a long time, since in all these cases he had had no report of recurrence. He directs that treatment is to be continued until the tensor tympani muscle has regained its contractile power, "then pause or cease treatment; as soon as the condition gets worse, begin treatment again."

He draws the following conclusions: (1) In all patients with otitic sclerosis the tensor tympani muscle does not functionate at all, or only weakly; very seldom it is retained, and in these cases one must think of the isolated primary affection of the stapedius muscle. (2) Tinnitus disappears under faradization, either entirely, or else diminishes to such an extent that the patients are not uncomfortable. (3) The hearing distance is improved by the treatment. (4) With faradization the electrode must be introduced into the mouth of the Eustachian tube, and the tip pressed against the upper wall. The second electrode is best placed at the angle of the lower jaw and the mastoid. (5) The intensity of the current must vary with the patient; as a rule, use a current strength as great as the patient can bear. (6) The duration of the seances should be from three to five minutes, and not less than three times a week.

It seems doubtful if others will be able to obtain such brilliant results by this method.

Deaf Mutism. Victor Hammerschlag,¹ of Vienna, makes a plea for a new nomenclature, in an article entitled "The Necessity of Introducing a Precise Nomenclature for the Different Forms of Deaf Mutism." He bases his division of deaf mutism on the principle of etiology, claiming that in this manner the anatomicopathological findings can easily be included. He condemns the division of deaf mutism into "congenital" and "acquired" forms, agreeing with Görkes that these two forms really belong to the "acquired deafness," since it is acquired in both instances, the one during fetal life and the other postfetal. He says otologists have had no success up to this time in classifying these two forms according to their anatomicopathological side, nor have they succeeded in finding any clinical signs by which to differentiate one from the other with any certainty. One is still forced to rely entirely on the history, because this old division dates back to the time when the pathological anatomy of deaf mutism was not understood.

He divides them into two chief groups: (1) Deaf mutism caused by local disease of the organs of hearing; (2) constitutional deaf mutism. The localized disease of the organs of hearing causing deaf mutism (in an otherwise healthy individual) is naturally always "acquired," either intra-uterine or, more frequently, "postfetal." The constitutional deaf mutism is to be considered as a general constitutional anomaly

¹ *Monatsschrift f. Ohrenheilkunde*, 1908, vol. xlii, Heft 11.

of the affected individual; the underlying pathological changes are only an expression of the general constitutional diseased condition. The constitutional deaf mutism he subdivides into (*a*) the endemic constitutional deaf mutism, (*b*) the sporadic constitutional deaf mutism. The latter form he designates as an "hereditary degenerative type."

THE ABILITY OF DEAF MUTES TO SWIM. The interesting question regarding the ability of deaf mutes to swim has recently been brought up again in connection with the improved methods of investigating labyrinth disease.

Moure and Cauzard, at the Congress of French Otologists, at Paris, in May, 1909, quote James, an American observer, as having said that it is almost impossible for deaf mutes to swim. Mackenzie in commenting on the subject calls attention to the fact that James referred to their inability to swim under water.¹ This inability is due to the absence of or paralysis of the vestibular apparatus. Thomas has demonstrated this in recent experiments in which he divided the vestibular nerves of dogs, and found that they were subsequently unable to maintain their equilibrium while in the water. Destruction of the cerebellum, the vestibular nerves being left intact, did not affect their equilibrium under similar conditions.

Concerning the general question of the ability of deaf mutes to swim, he quotes from a letter from the Headmaster to the Royal Institution for the Instruction of Deaf and Dumb Children at Edgbaston, Birmingham, England, July 1, 1909. Mr. Brown writes as follows: "(1) We teach all our deaf mutes to swim, except those whom, for health reasons, our medical officer has forbidden swimming lessons. (2) Our swimming instructor, who has taught swimming for forty years, says they learn quicker than normal children, and sooner acquire a good stroke. (3) They swim perfectly well with closed eyes, but they cannot direct themselves by sound; and of course, they cannot tell, except by guessing, when they are approaching the end of the bath.

"To test this I took about fifteen of our senior boys into the swimming bath. The bath is about 48 feet long and 17 or 18 feet wide. I asked each boy to dive from the middle of one end and swim a length with his eyes tightly closed. All swam very well, and the majority kept almost perfect direction. One boy came against the side about six feet from the far end of the bath."

Mackenzie says that the discrepancy between this report and the older reports, that deaf mutes experience difficulty in swimming, is probably more apparent than real.

It is very true that many deaf mutes have a perfectly active vestibular sense, and there is no reason to suppose that they would experience any difficulty in swimming.

¹ Journal of Laryngology, Rhinology, and Otology, October, 1909.

On the other hand, it is certain that deaf mutes in whom there was no vestibular sense would need to have had a long education in compensatory methods of equilibration before they could support themselves on, or under, water. It seems highly probable that a careful investigation of this and allied questions, regarding the ability of those without any vestibular sense to do complicated feats of orientation will reveal the fact that they are unable to do any but the comparatively simple ones, and then only under favoring circumstances.

FUNCTIONAL TESTS OF HEARING. The adoption of a universal method of recording functional tests has long been discussed, and the advantages to be derived are very apparent.

Politzer, Gradenigo, and Delsaux presented an acoumetric formula for this purpose at the Seventh Otological Congress, at Bordeaux, in 1904, and a committee was appointed to further elaborate this and report to the Eighth Congress in Budapest.

The committee consisted of representatives from the following countries: Denmark (Hölger), Germany (Panse), Holland (Quix), Italy (Gradenigo), Austria (Politzer), Switzerland (Siebenmann).

The majority of the committee were united in a proposed formula. This was presented and explained by Dr. Jörgen Möller, in a paper entitled "Uniform Acoumetric Formula Accepted by the Eighth Otological Congress, at Budapest, 1909," a translation of which has been made by Dundas Grant.¹

The Committee's Proposals are as follows: "In order that it may be possible to express the result of auditory functional tests in as nearly as possible an identical and generally intelligible way, it is desirable that the schematized formula drawn up by the committee should be adopted, and if abbreviations are employed, that they should be those which the committee has formulated. The descriptions of the individual tests should be founded on the initial letters of the Latin names, and the pitch of tones should be indicated according to the German (Helmholz's) musical nomenclature. The results of the tests are written down in a horizontal line. The formula accepted by the committee has such appearances as the following:

\nearrow	AD	25	20	30	$\div 8$	2,0	8,0
WS (15) + 5	a ¹ M (20)	a ¹ A (60)	c ⁴ A (30)	R (35)	H (3,0)	P (15,0)	
AS	20	60	30	+ 35	3,0	15,0	
	15,0	3,0	D ₁	40,000			
	V (38)	v (78)	LI	LS			
	> 20	15,0	C ₂	40,000			

"AD and AS indicate *Auris dextra* and *Auris sinistra*.

"W indicates *Weber's test*, the lateralization being shown by an arrow pointing in the appropriate direction; if there is no lateralization,

¹ The Journal of Laryngology, Rhinology, and Otology, December, 1909.

the sign = (equal) is put down; if the tuning fork is not heard at all on the vertex, then a zero. For these tests the tuning fork a^1 (435 d. v.) is employed.

" S means *Schwabach's experiment*, the difference of the time as compared with the normal being expressed by means of a $+$ or a \div ¹ with the number of seconds, or, if necessary, with an $=$ when the duration of perception is normal. For this, also, the same tuning fork, a^1 (435), is used, the normal duration of perception for the fork used being noted.

" a^1M indicates the length of perception of the tuning fork a^1 (435) on the mastoid process ($M = mastoideus$, bone conduction). The normal duration is added, the duration of perception by the right and the left ear of the patient being indicated in seconds above and below the lines respectively; if only the difference of duration greater or less than normal is measured, it can be noted by means of a $+$ or \div , and for rapid examination without the statement of the number of seconds simply $+ d. h.$ (lengthened) or $\div d. h.$ (shortened); normal duration of perception on the part of the patient is in this case indicated by $=$. A normal time of perception for the fork employed must be noted in cases in which the difference in duration alone is measured. Instead of the tuning fork a^1 , another, such as, for example, c^2 (512), may be used.

" a^1A indicates the length of perception of the tuning fork a^1 (435) when held directly opposite the meatus ($A = aër$, air conduction). The other indications are exactly as given for bone conduction.

" c^4A indicates the duration of perception for the tuning fork c^4 (2048) when this is held opposite the meatus.

" R stands for *Rinné's test*, the difference between the air and bone conduction, or it may be between bone conduction and air-conduction. The number of seconds is inscribed in such a way that a $+$ is used when air-conduction and a \div when bone-conduction preponderates; if the duration of hearing of air and bone conduction is the same, it is indicated by $=$; for superficial investigation it may be sufficient to indicate simply $+$ or \div without adding the number of seconds. If the tuning fork is only heard by air conduction, this can be indicated by $+ t$, when only by bone conduction by $\div \vartheta$, while the amount of the difference is put down as $t \div \vartheta$, t being used to indicate air conduction and bone-conduction. If the difference in duration in Rinné's experiment is to be fixed, the normal difference of duration for the fork employed must be added in brackets. For this experiment the tuning fork a^1 (435) is used.

" H stands for *Horologium* (watch), the normal distance of audibility in meters being put in brackets, the distance for the right and

¹ This \div (division) symbol is the one used in the author's MS., but is probably intended to be equivalent to our $-$ (minus).

left ear of the patient being marked above and below respectively. If the watch is only heard on contact with the auricle the letters *a. c.*, = *ad concham*, are put down.

“*P* indicates *Politzer's acoumeter*. The distance is written in meters in the same way as for the watch.

“*V* (*Vox*) indicates ordinary conversational voice, *v*, whispered voice; the distance is put down in meters and the words employed added in parenthesis. If all the test words are heard at the full distance available, then it is to be assumed that at least a few words can be heard at a greater distance; in this case, the amount of the distance in meters is written down with the sign $>$ (greater than). If the voice is only heard in the immediate neighborhood of the ear, it is put down as 0,01, *d. h.*, that is, 1 cm. If the tests are made with words of equal intensity of ‘isozonality,’ as classified by Quix,¹ those different groups are bracketed together and the value for the deepest group should come first.

“*LI* indicates *Limes inferior*, the lower limit. It is, when possible, determined by means of Bezold's continuous tone series, and the deepest heard tone marked with its musical denomination or else with the number of double vibrations per second to which it corresponds. If the investigator has not got a continuous tone series at his disposal, but only, for example, a series of *C* forks for the different octaves, there must be added after the description of the deepest double forks the sign $<$ (less than), which indicates that perhaps still deeper tones might be heard. In these cases it must be indicated with what series of sound the investigation is made.

“*LS* indicates *Limes superior*, the upper limit. If this is determined by means of Edelmann's Galton whistle, the vibration number of the tone is marked down. In other cases the pitch of the tone is tested with the nature series of sound, such as Schulz's monochord, or König's rods, etc.; this must be expressed in the description of the functional test; the highest pitched tone which is heard is taken as the limit.

“It is permissible under certain circumstances to omit some of the methods of examination, as any particular tests with the watch and with Politzer's acoumeter, as also Schwabach's and Rinne's tests, if the bone and air conductions are tested separately, as also, on the other hand, the bone and air conduction if Schwabach's and Rinne's tests are preferred. On the whole, it is advisable, however, to employ all the tests. If any of the tuning fork tests are made with a different fork from the one above described, the fork employed must be adequately described. If, again, tests are made with any other sounding fork than those which are set forth in the formula, the description of the

¹The Seventh International Otological Congress, held at Bordeaux, August 1 to 4, 1904 (see *Journal of Laryngology, Rhinology, and Otology*, October, 1904, p. 532).

fork employed and the duration of perception can be added behind the main formula. Exceptional methods of testing, such as Gellé's and others, must be put down with their full description.

"In the case of any further quantitative tests the methods in each individual case (each publication) must be clearly described, as also any graphic charts which may be employed.

"The pitch of the tuning forks and of other series of sound should be described in the following way: The notes of the scale are called *c, d, e, f, g, a, h* (= English *b* natural); the intermediate tones are described in the mode customary in German musical language, in so far as the lowering of a note by a semitone is indicated by the addition of *s* or *es* to the name of the original tone (for example, *des, es, as*); the raising of a semitone, on the other hand, by the addition of *is* (for example, *fis, gis, ais*); a flattened *h* is called *b*. The height of the octave is described in the following way: *C₂, C₁, C, c, c¹, c², c³, c⁴, c⁵*, indicating a *C* of 16, 32, 64, 128 (*d. v.*), etc.

"The vibration numbers of the tuning forks are always expressed in double vibrations; as an example the following may be taken as representing the tests in an imaginary case:

<i>AD</i>	÷ 5	0	÷ 20	5,0	0,60	<i>c</i>	15,000
<i>W</i> = <i>a¹M</i> (20)		<i>a¹A</i> (60)	<i>c⁴A</i> (30)	<i>V</i> (28)	<i>v</i> (28)	<i>LI</i>	<i>LS</i>
<i>AS</i>	=	÷ 20	÷ 10	15,0	3,0	<i>A₁</i>	40,000

"It is to be read as follows:

"A tuning fork on the vertex is not lateralized; in the right ear the bone conduction is diminished, the air conduction for *a¹* is absent; for *c⁴* shortened; the hearing power for conversational and whispered voice, the test word being 'twenty-eight,' is somewhat diminished. The lower limit is pushed distinctly upward, the upper limit somewhat lowered. In the left ear bone conduction is normal, air conduction shortened; hearing power for conversational and whispered voice somewhat diminished; the lower limit pushed somewhat upward the upper limit normal. Diagnosis: Combined middle-ear and labyrinth disease on the right side; pure middle-ear disease on the left one.

<i>AD</i>	÷	÷	+ <i>t</i>	0	0,1	1,5 - 1 - 1
<i>W</i> 0	<i>a¹A</i> (20)	<i>c⁴A</i> (30)	<i>R</i> (35)	<i>H</i> (3,0)	<i>P</i> (15,0)	<i>V</i>
<i>AS</i>	÷	÷	+ 20	<i>a.c.</i>	0,5	2 = 1,5 - 1
		0		16	15,000	
		<i>v</i>		<i>LI</i>	<i>LS</i>	
		0,4 - 0,1 - 0,01		16	9000	

"The tuning fork upon the vertex is not heard; the air conduction is diminished upon both sides; Rinne is positive, the fork not being heard on the right mastoid; the watch is not heard in the right ear

at all, but by the left one only on contact; Politzer's acoumeter is heard on the right side at 10 cm. and on the left one at 50. Conversational voice tested with three of Quix's groups of words is only heard at a slight distance, especially those words consisting of high tones and of considerable carrying power (which under normal circumstances are heard much further than deep tones); whispered voice is not heard on the right side, and only for a short distance on the left one; high and far carrying tones are only heard if they are spoken directly into the ear; the lower limit normal (16 *d. v.* = C_2); the upper limit much reduced. Diagnosis: Bilateral labyrinthine disease.

"The committee request that every reader of the paper will exercise his influence in his circle in order to have the above-described rules followed in every test for the auditory function."

It is to be hoped that this easily comprehended formula will be made use of in the future by those who report cases in which a functional test is recorded.

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